



“Sustainable and Equitable Multifamily Housing”

OUR TEAM



Ellie Fulkerson
4th Year Undergrad
Civil Engineering
Minor in Architecture



Christopher Banks
4th Year Undergrad
Civil Engineering



Jessica Lee
4th Year Undergrad
Civil Engineering
Minor in Architecture



Pang (Devin) Shen
4th Year Undergrad
Civil Engineering
Minor in Architecture



Robert Szymczyk
3rd Year Undergrad
Civil Engineering
Minor in Architecture



Saahir Ganti-Agrawal
3rd Year Undergrad
Materials Science
and Applied Math



Paul Abascal Larson
3rd Year Undergrad
Civil Engineering



Luc Almony
3rd Year Undergrad
Environmental Engineering
Minor in Environmental Policy



Polen Ton
2nd Year Undergrad
Civil Engineering



Aaron Huang
2nd Year Undergrad
Mechanical Engineering



Olivia Leonardis
2nd Year Undergrad
Civil Engineering



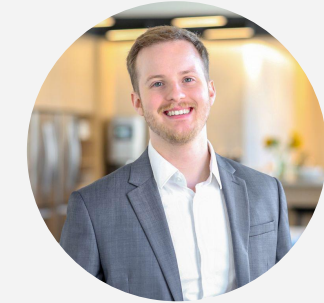
Peter Pinder
2nd Year Undergrad
Civil Engineering



Fay-Ling Laures
1st Year Undergrad
Undeclared

DESIGN PARTNER

Perkins&Will



Neil Reindel,
AICP, RELi AP
Designer and
Adjunct Professor

INDUSTRY PARTNERS

SOM

BURO HAPPOLD

emersion
DESIGN



FACULTY ADVISOR

Northwestern
McCORMICK SCHOOL
OF ENGINEERING



David Corr, S.E.
Clinical Professor
Undergraduate
Studies, Director

BUILDINGS AND CONSTRUCTION

40%

OF GLOBAL ENERGY
CONSUMPTION

Source: U.S. Energy Information Administration, 2022

2X

MORE WASTE THAN
MUNICIPAL SOLID WASTE

Source: U.S. Environmental Protection Agency, 2018

DISPLACEMENT



Source: Chicago Sun-Times, 1995

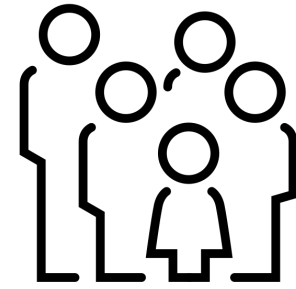
CABRINI GREEN PRE-DEMOLITION



Source: Getty, 2005

CABRINI GREEN CONTEXT

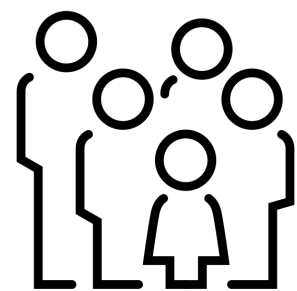
CABRINI GREEN CONTEXT



2800

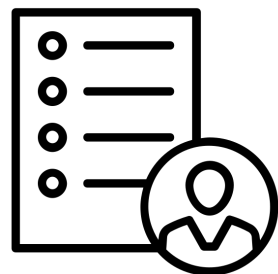
families displaced

CABRINI GREEN CONTEXT



2800

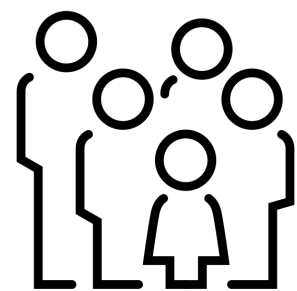
families displaced



85

families still on
waiting list

CABRINI GREEN CONTEXT



2800

families displaced



85

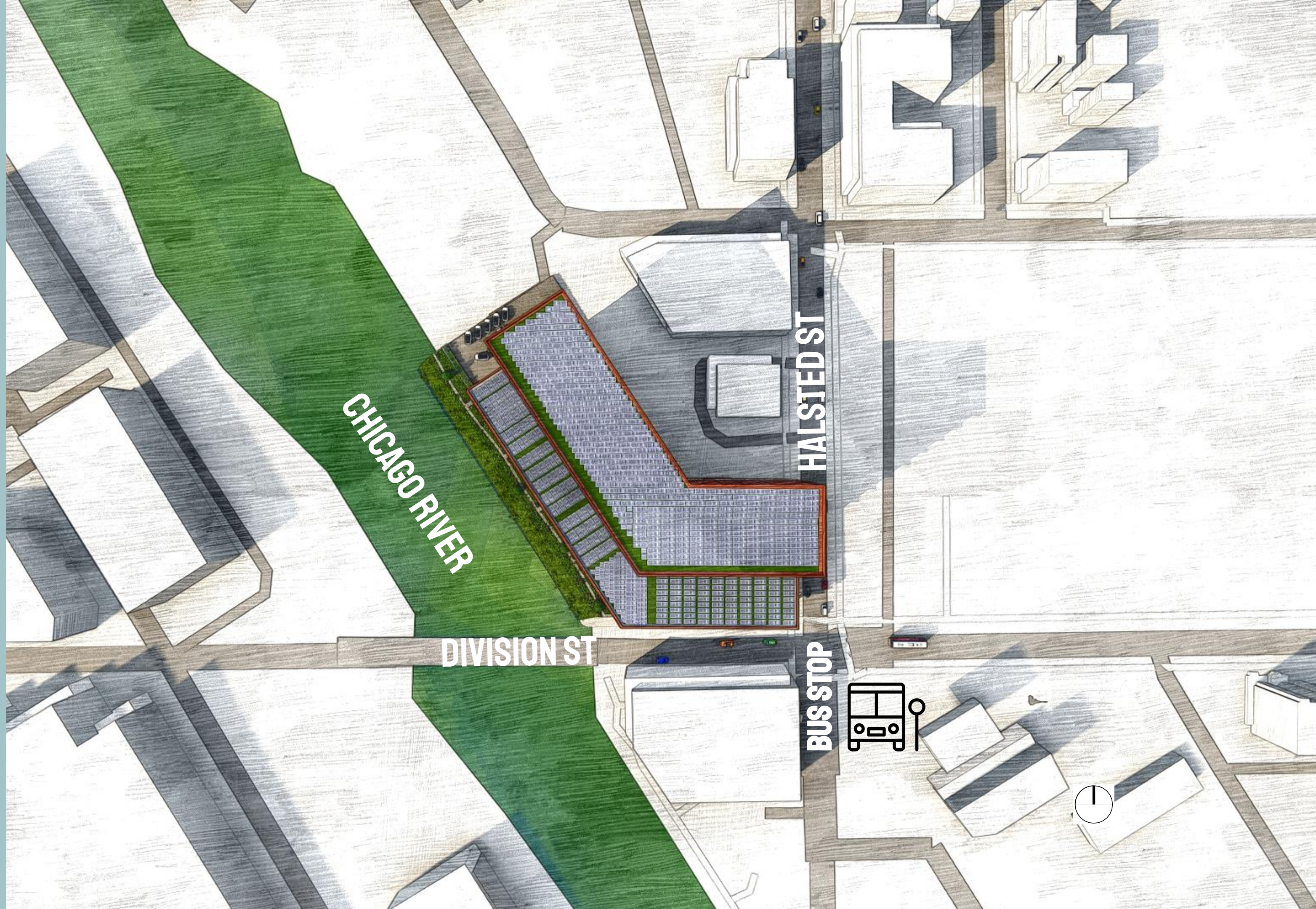
families still on
waiting list



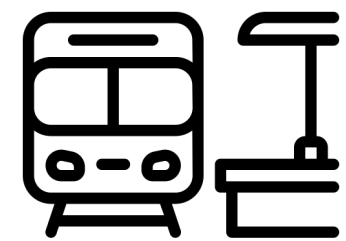
<2%

Promised
contracts and jobs
materialized

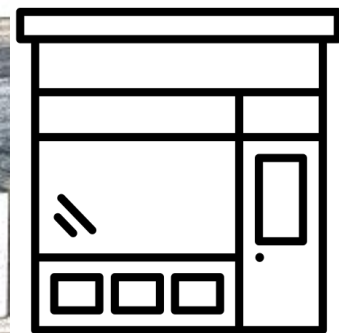
SITE CONTEXT



COMMUTER
RAIL



GROCERY
STORE



OUR MISSION:

Design a multifamily building
which **maximizes**
sustainability and
strengthens community

HOW WE ACHIEVE IT:

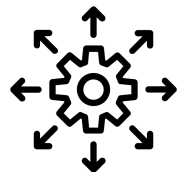
Maximize Sustainability



Passive Design



Healthy/Low CO₂ Materials



Active Systems

Strengthen Community



Equitable Programming



Affordable Rents and Costs



Holistic Live, Work, and Play



TreeHouse

COMMERCIAL

$\frac{1}{3}$
commercial

121,000
sq.ft.



TreeHouse

RESIDENTIAL



$\frac{2}{3}$
residential

160
units

(25%
affordable
housing)

TreeHouse

SPECIFICATIONS



Square Footage
334,035 ft²

EUI
-2.9 kBtu/sf/yr

51% less
Embodied CO₂

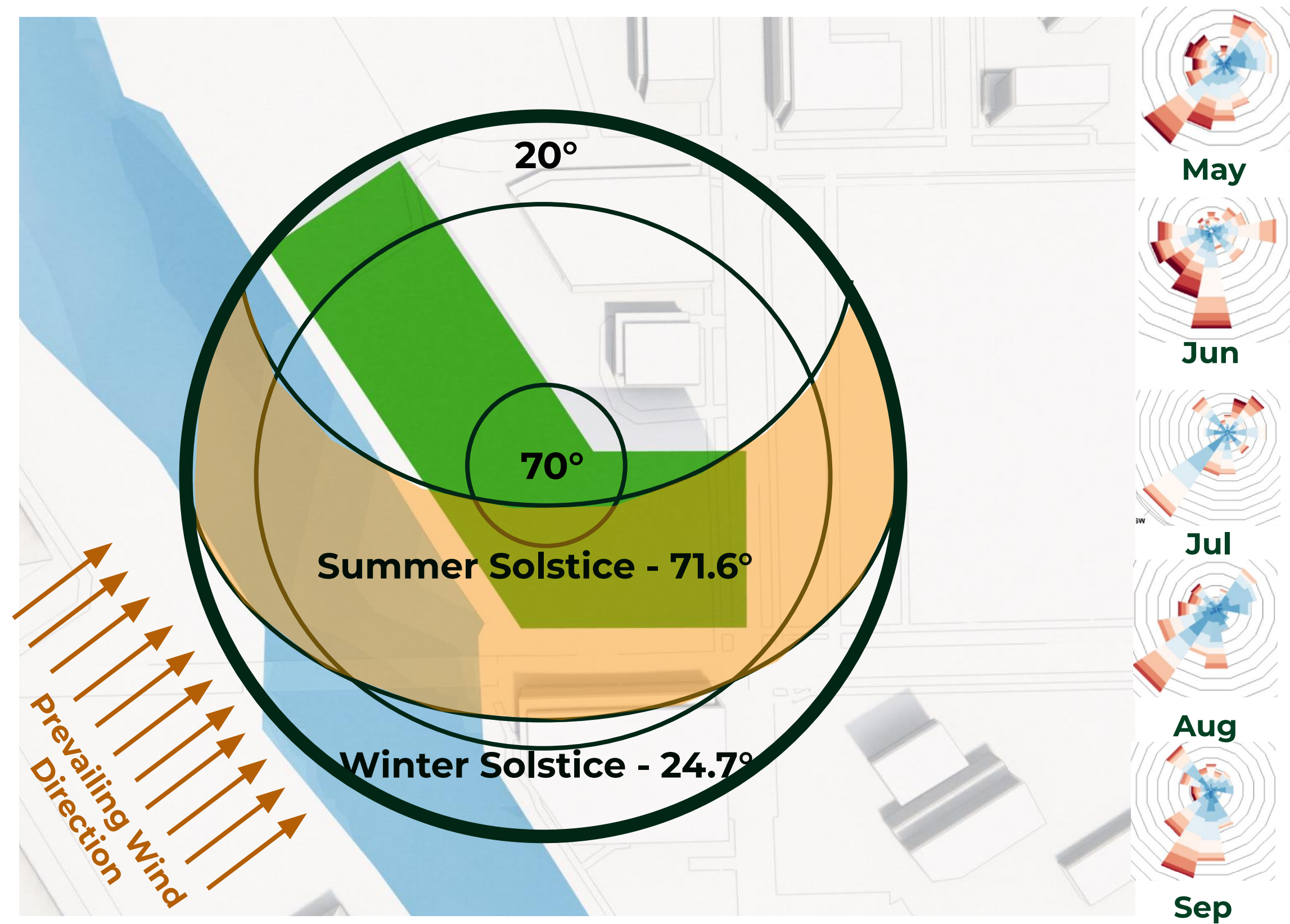
TreeHouse



SUSTAINABLE

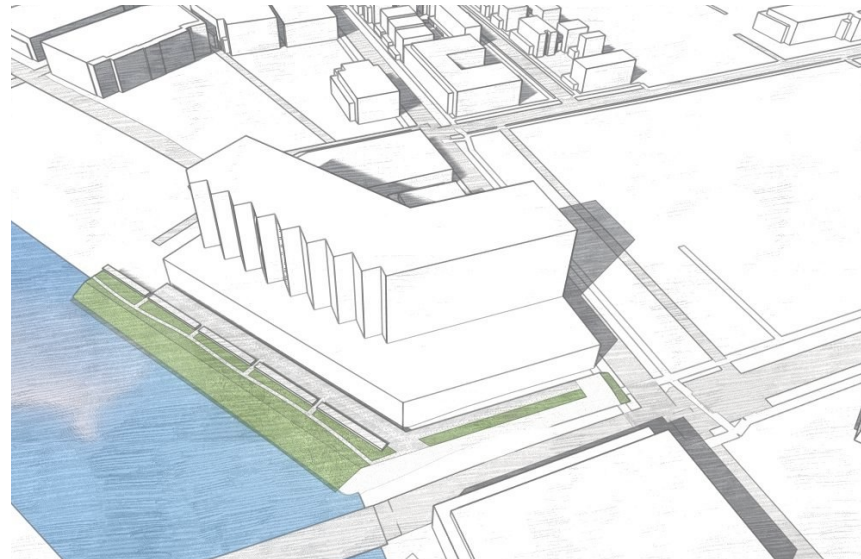
Design Approach

SUN ANGLES & WIND DIRECTION

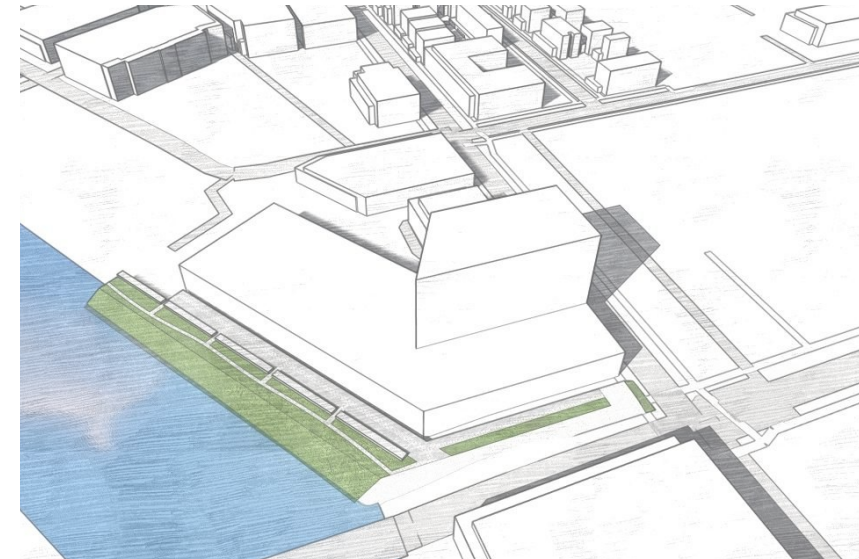


BUILDING MASSING

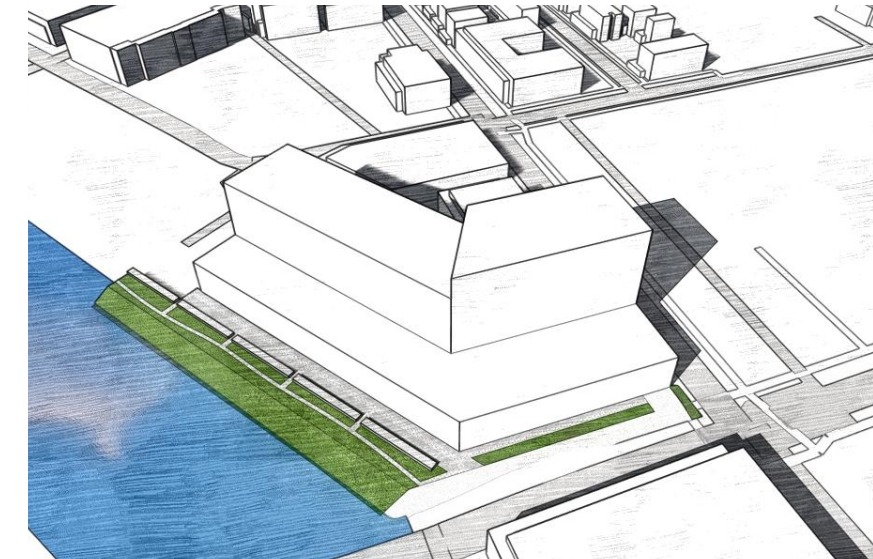
Massing 1



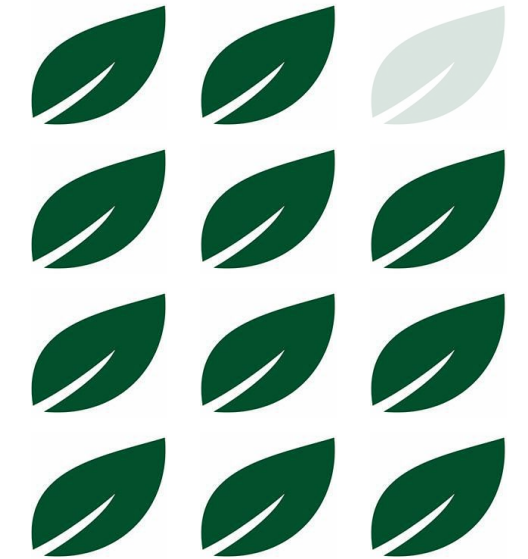
Massing 2



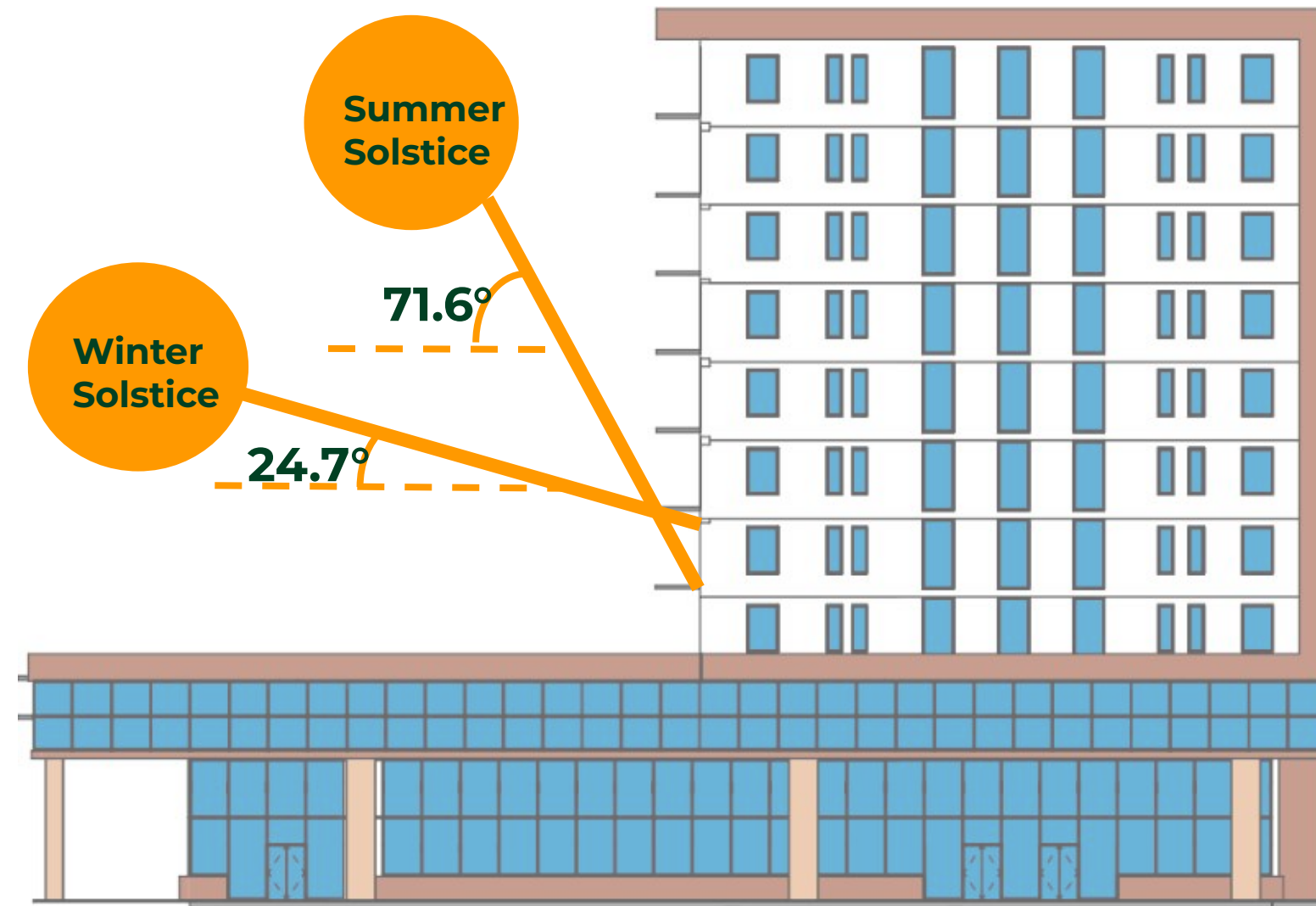
Massing 3



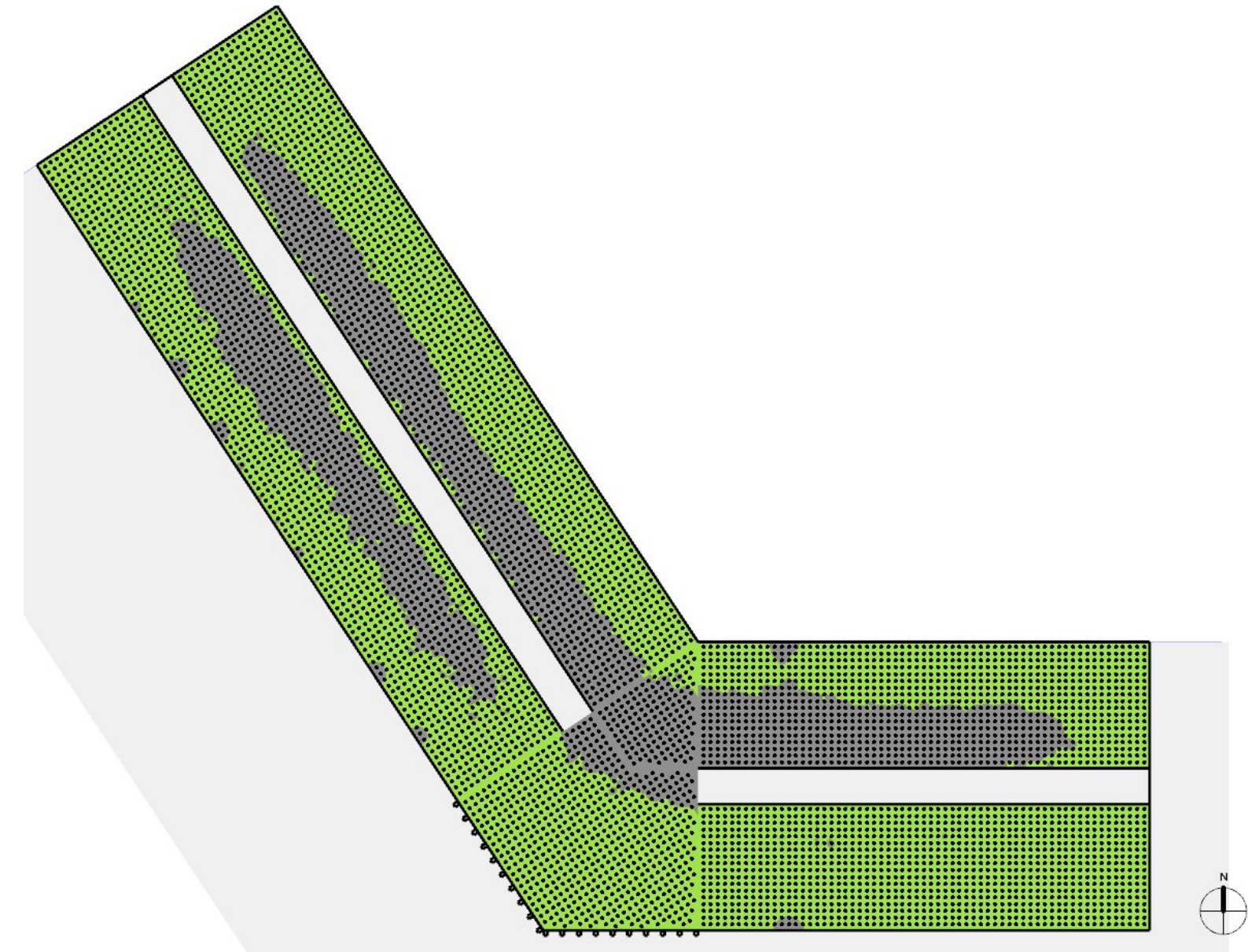
South Facade
Ventilation
Enough Units
Envelope



PASSIVE DESIGN

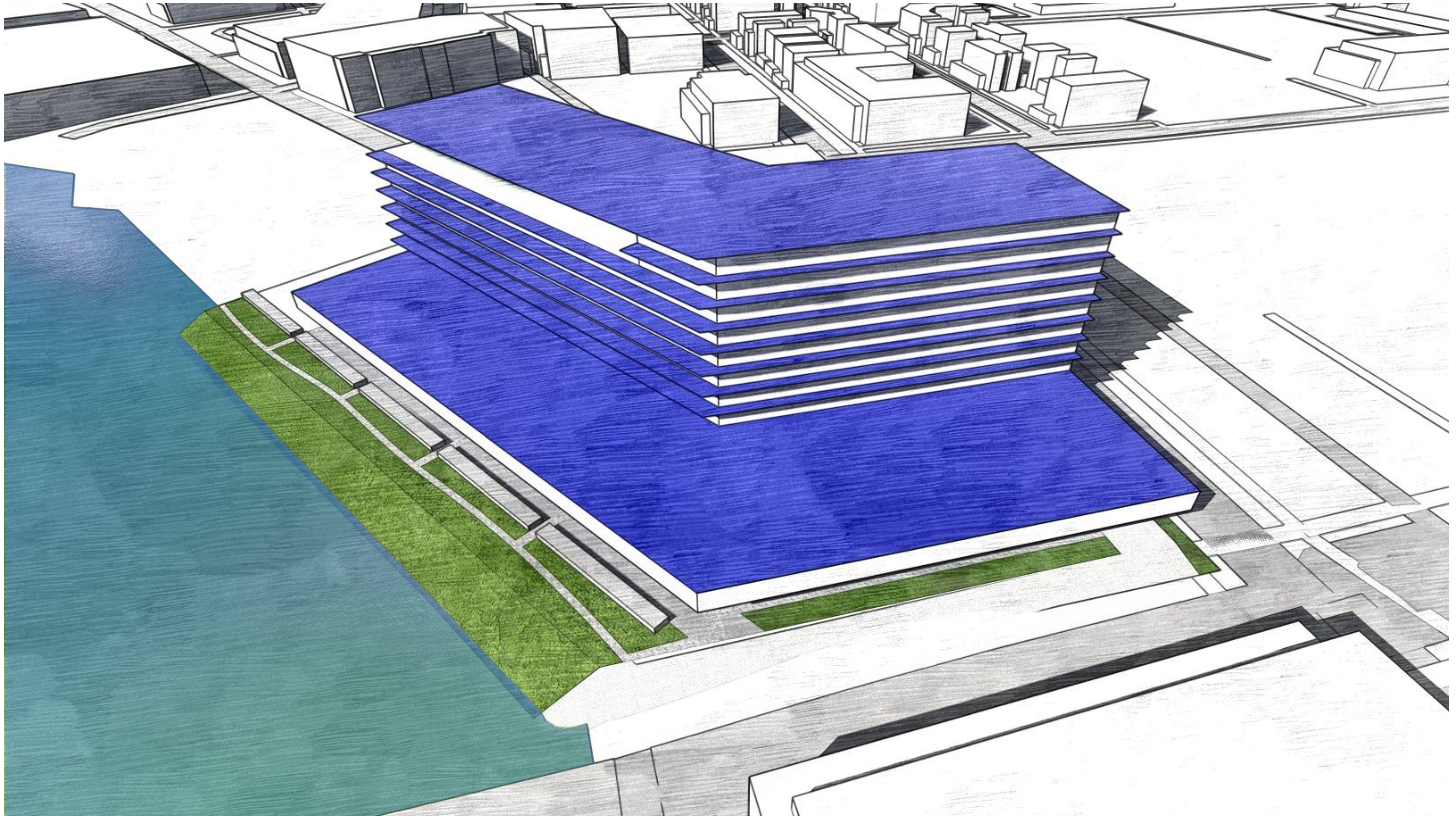


SOLAR SHADING

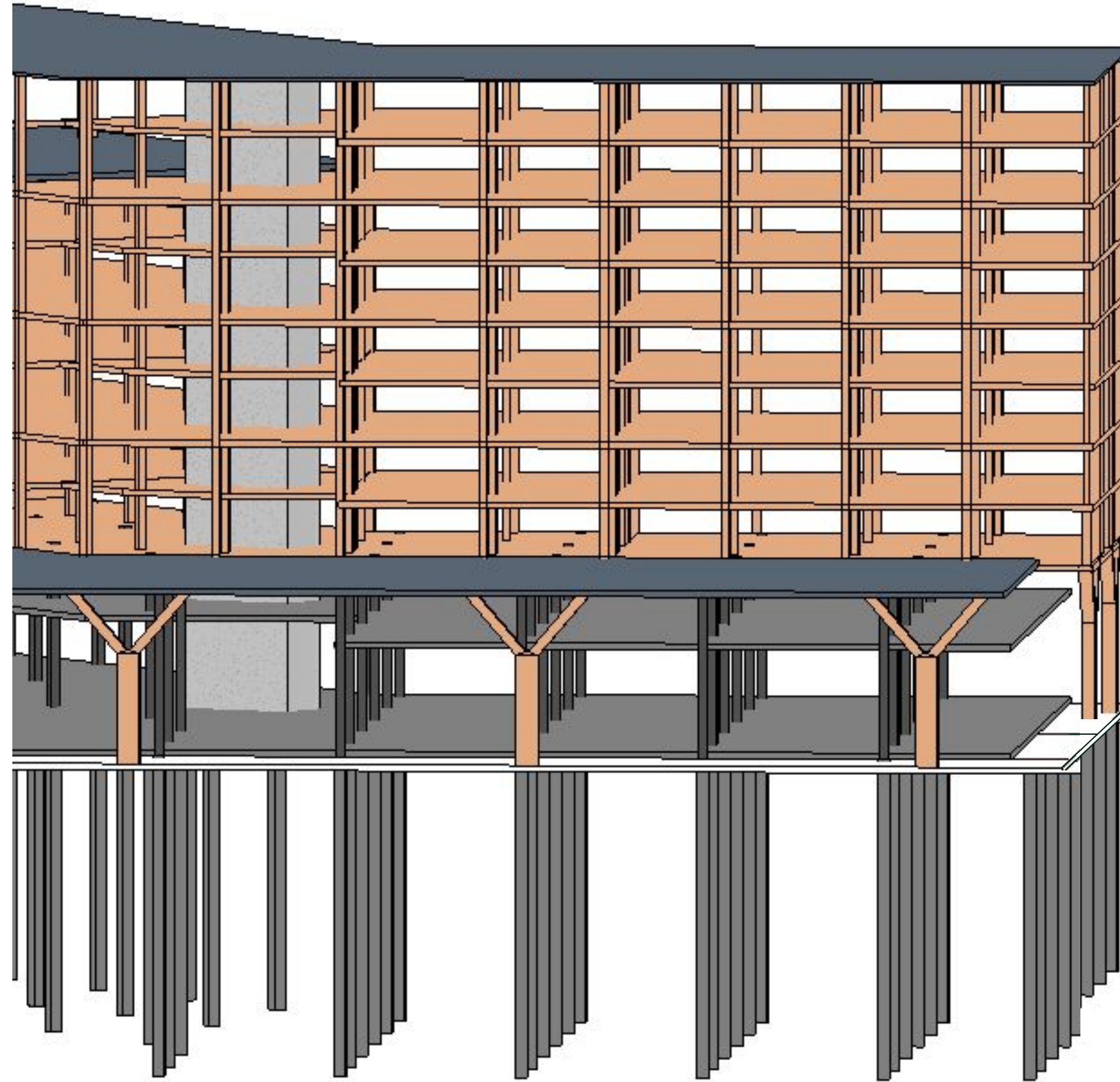


DAYLIGHTING

GENERAL MASSING



STRUCTURE

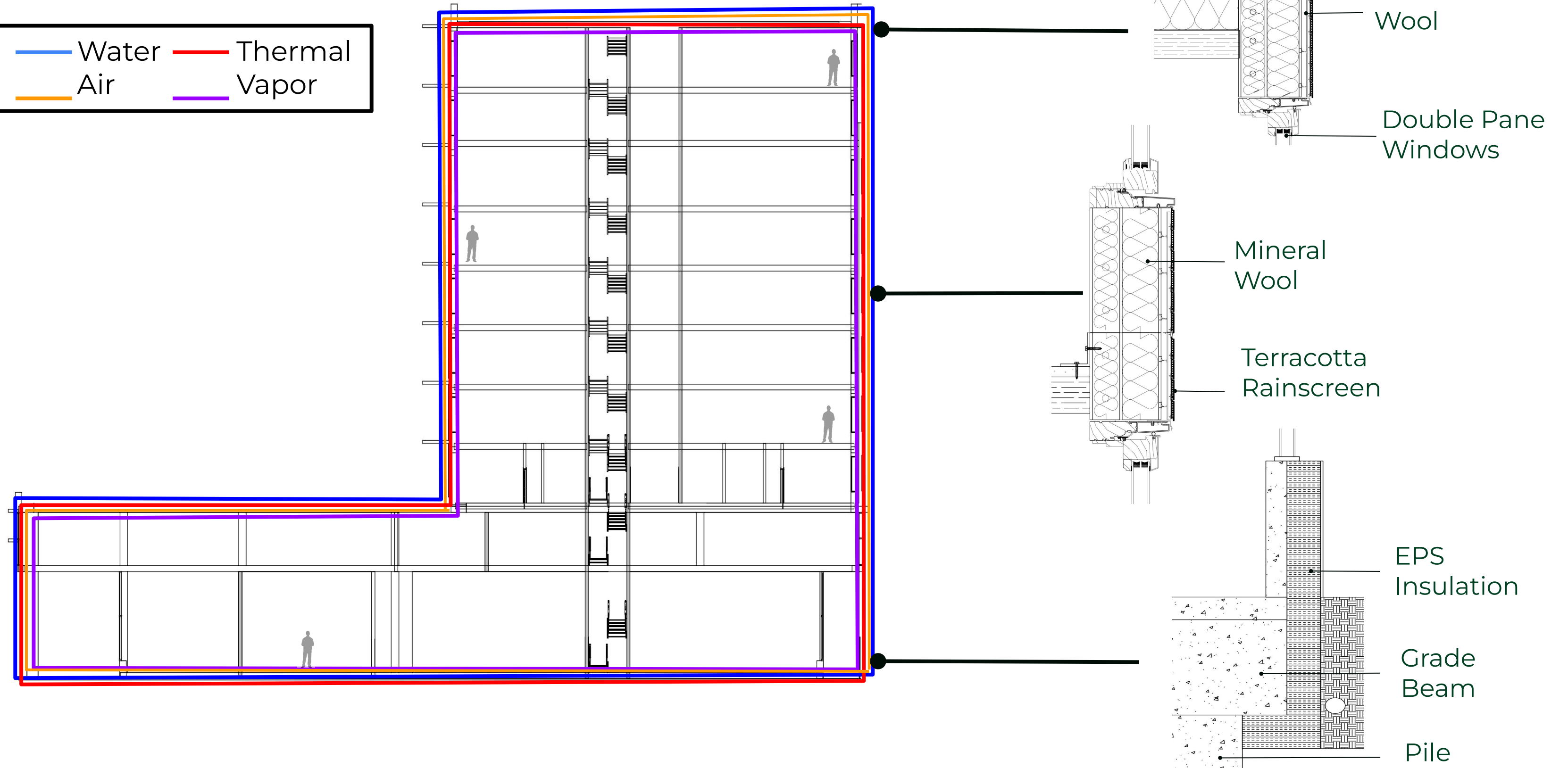


**CLT/
Glulam
Structure**

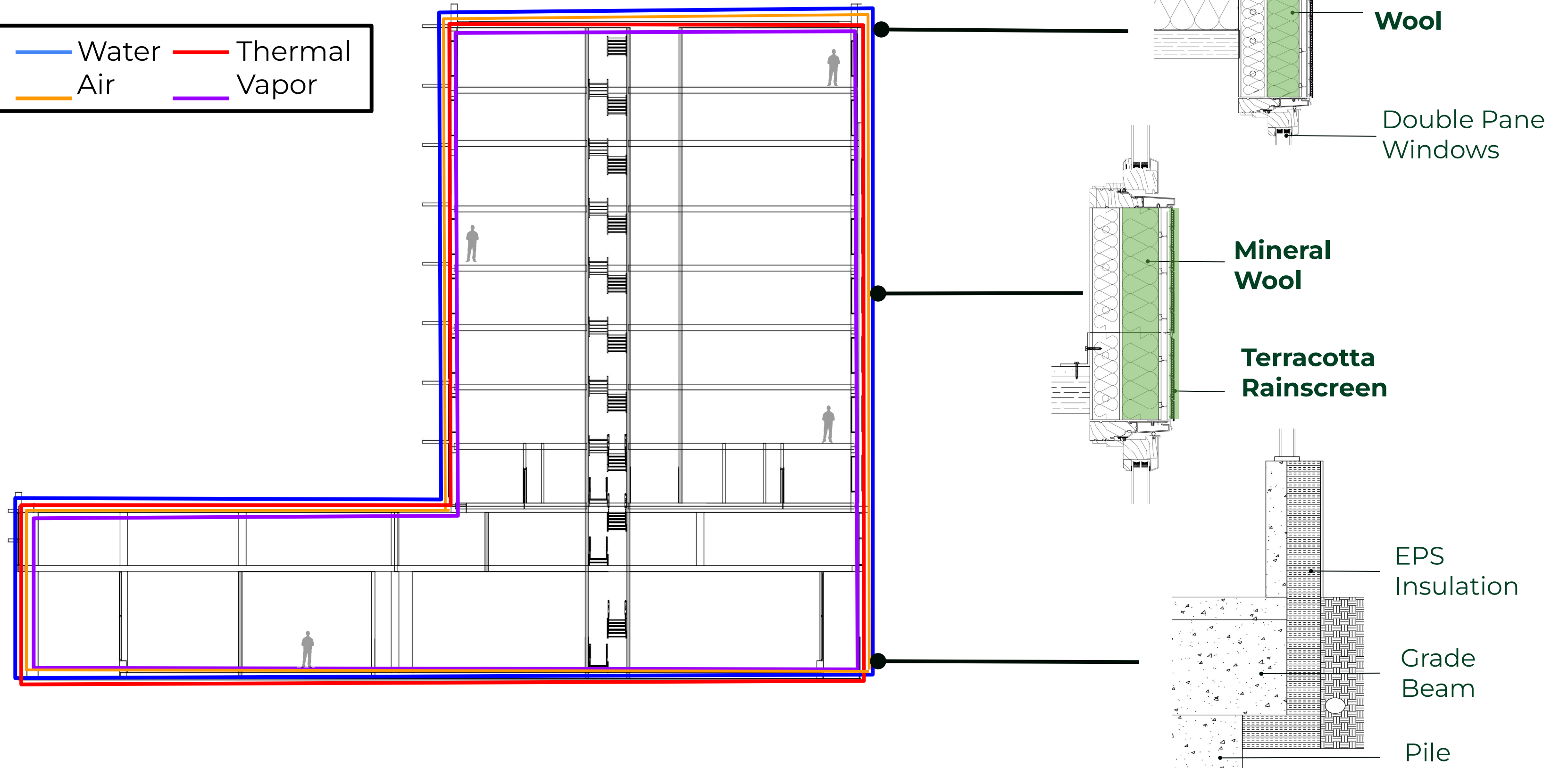
**Concrete
Podium/CORE**

**Geothermal
Pile
FOUNDATION**

ENVELOPE



ENVELOPE



PREFABRICATION

20%

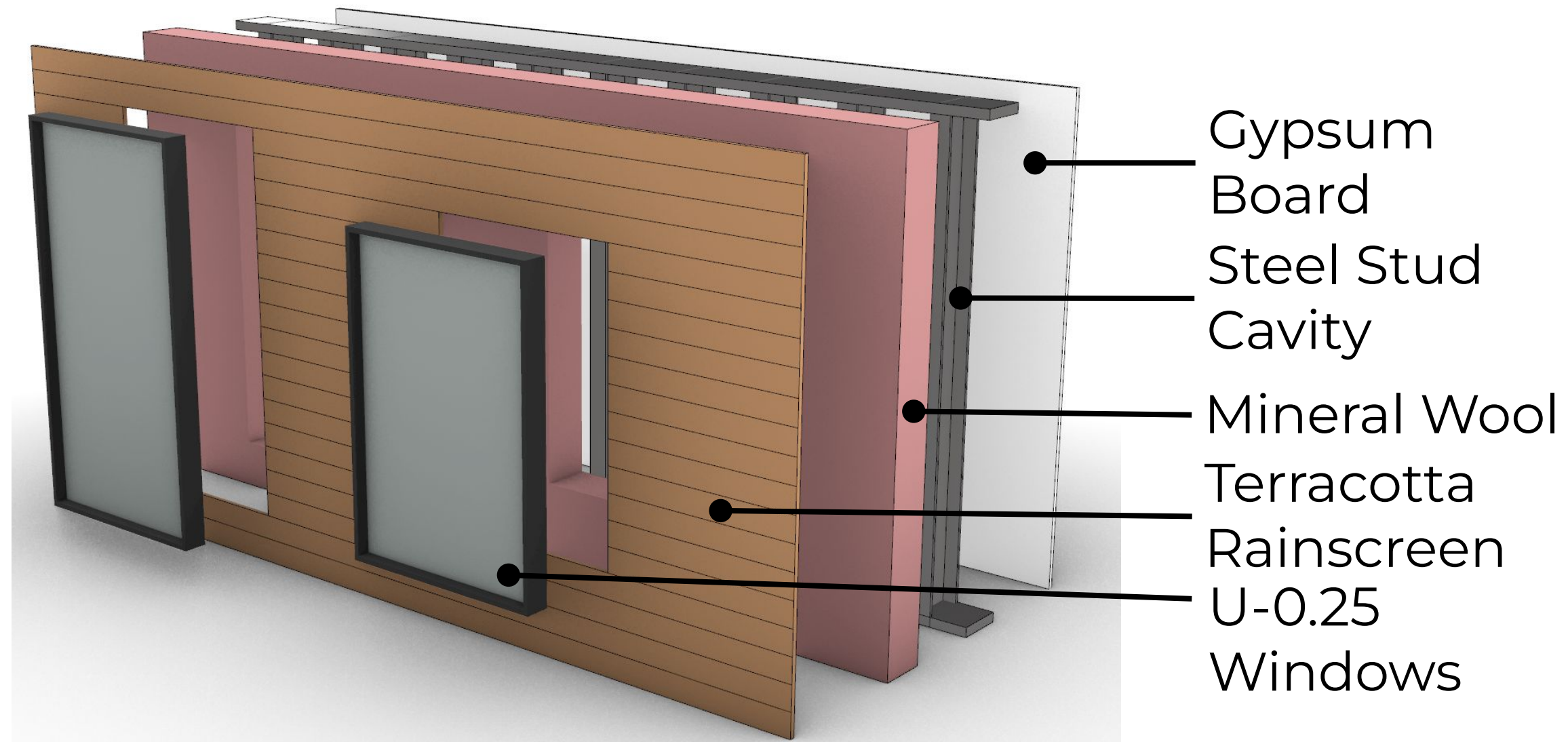
Cost savings

20-50%

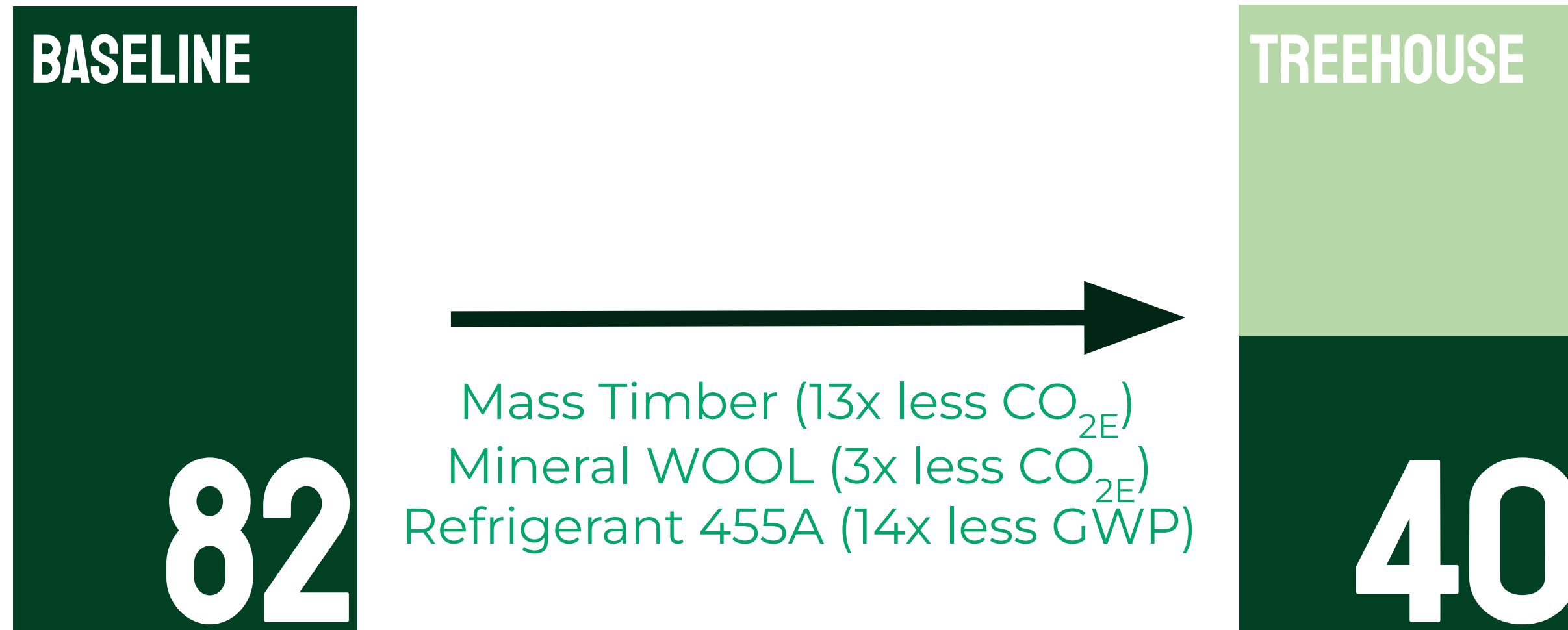
Faster construction timeline

80%

Reduced waste

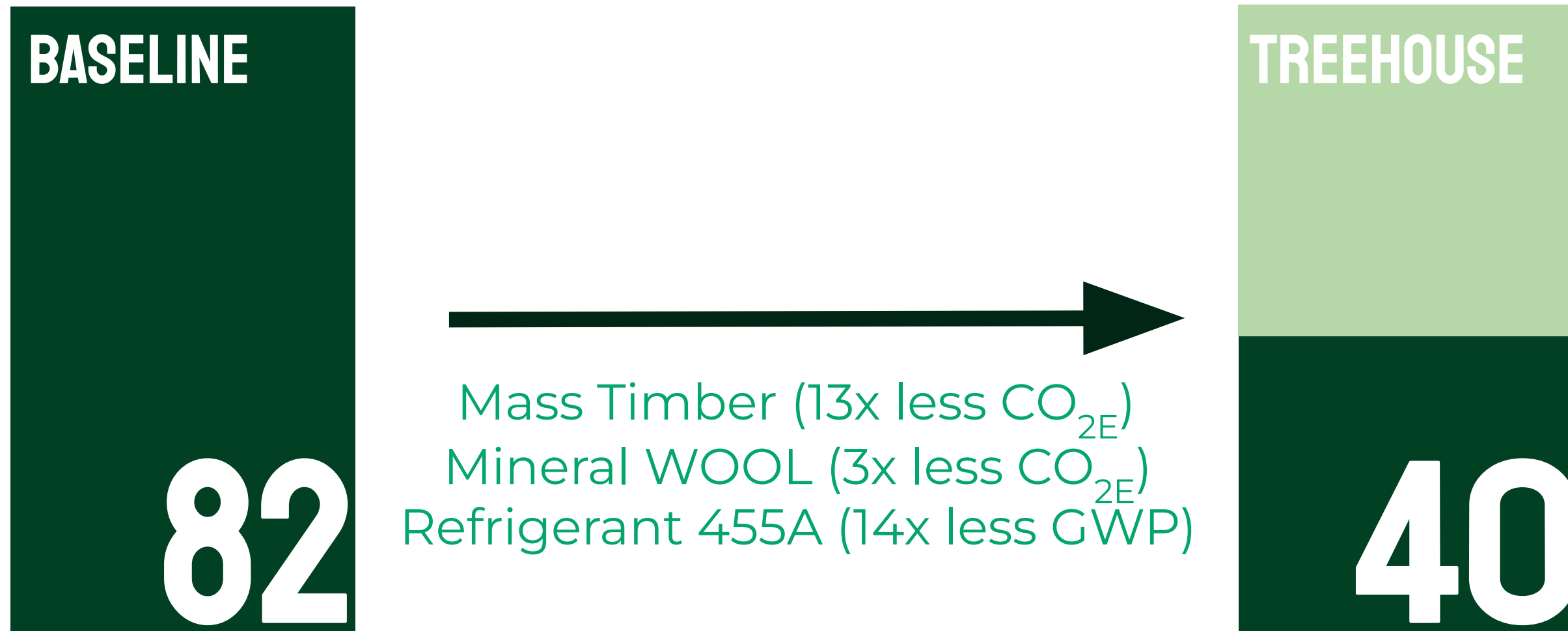


EMBODIED CARBON OVERALL



Embodied CO₂ (lb CO₂/ft²)

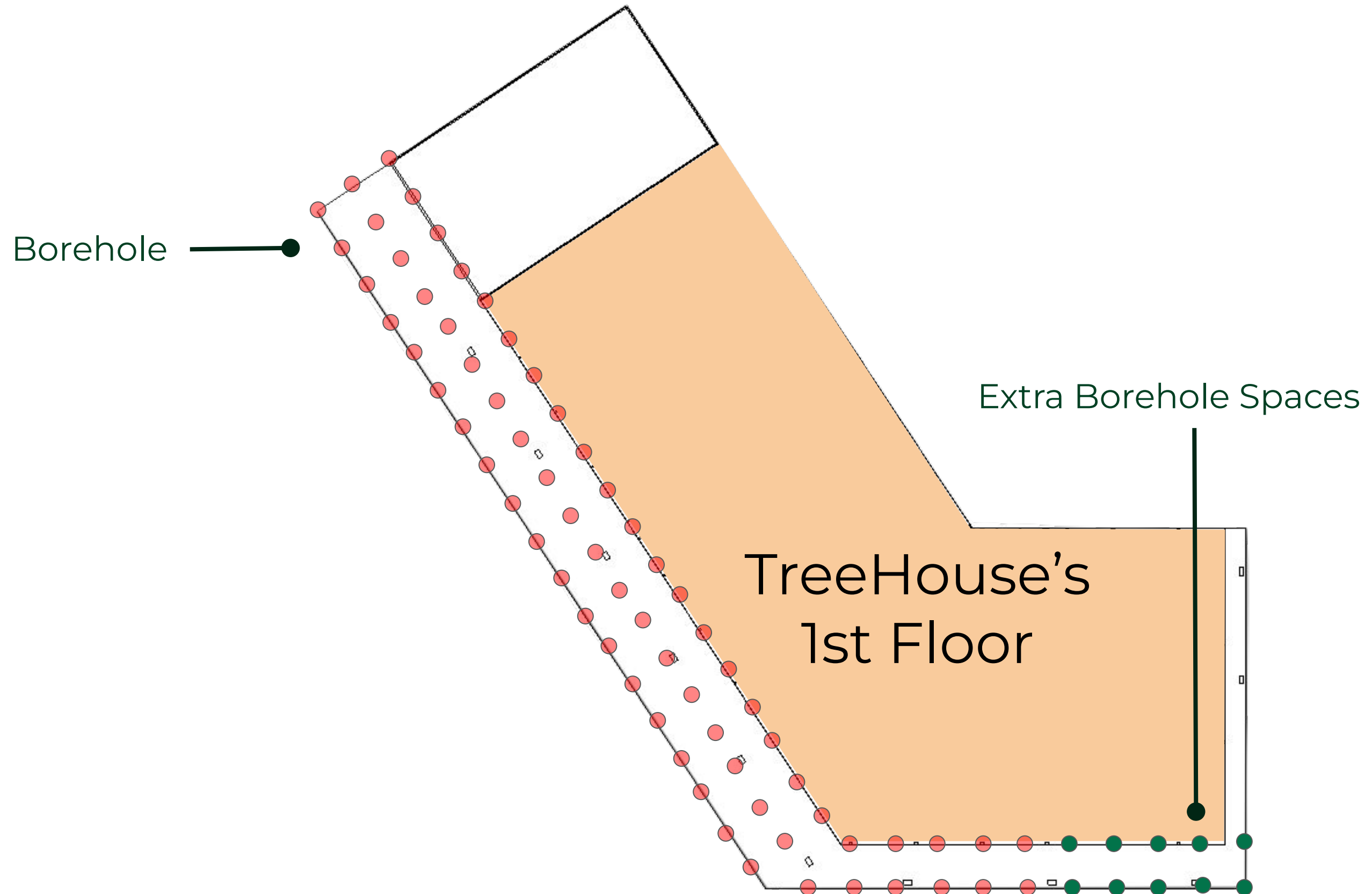
EMBODIED CARBON OVERALL



Embodied CO₂ (lb CO₂/ft²)

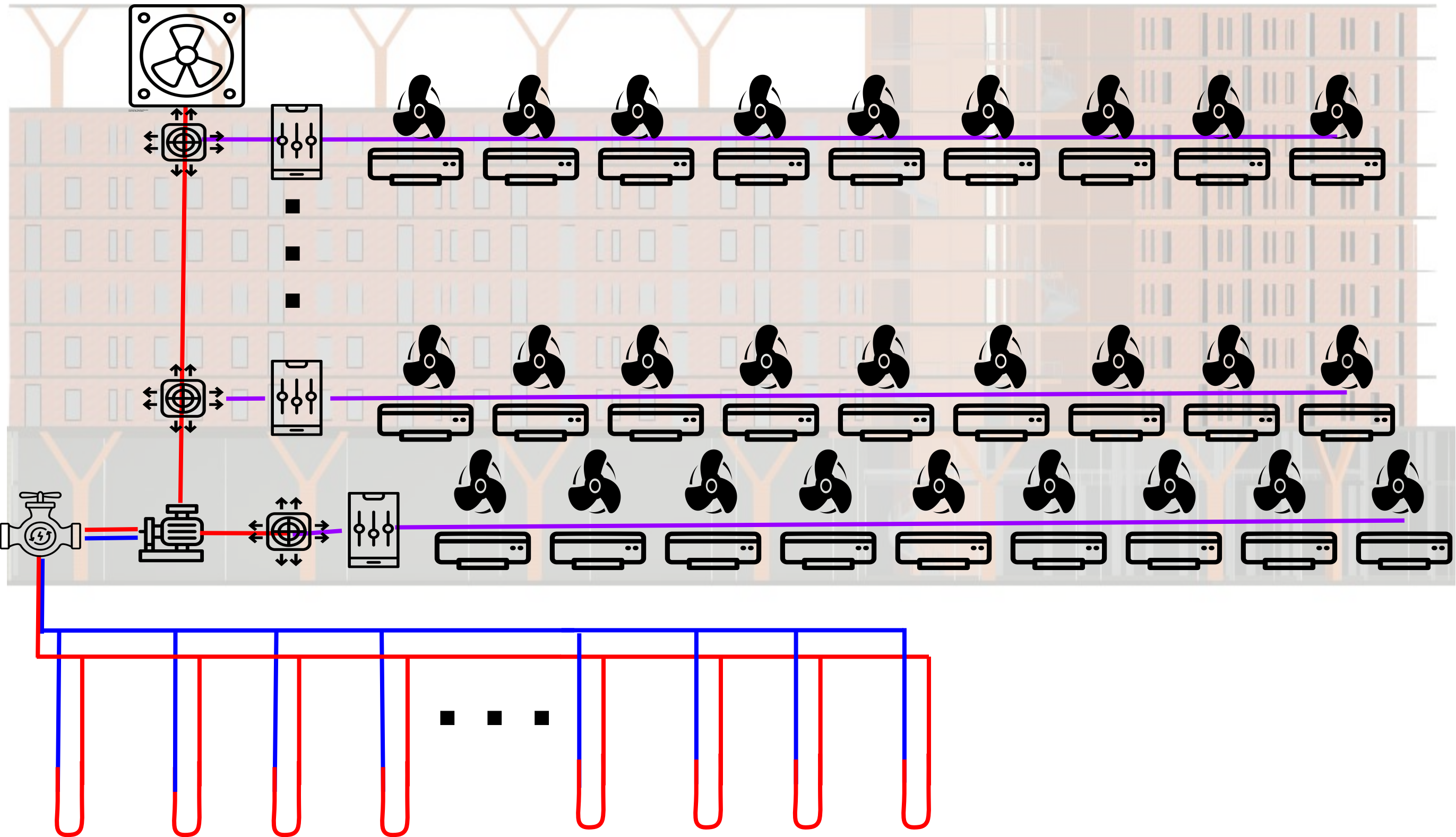
51% REDUCTION

ACTIVE SYSTEMS GEOTHERMAL BOREHOLES



ACTIVE SYSTEMS

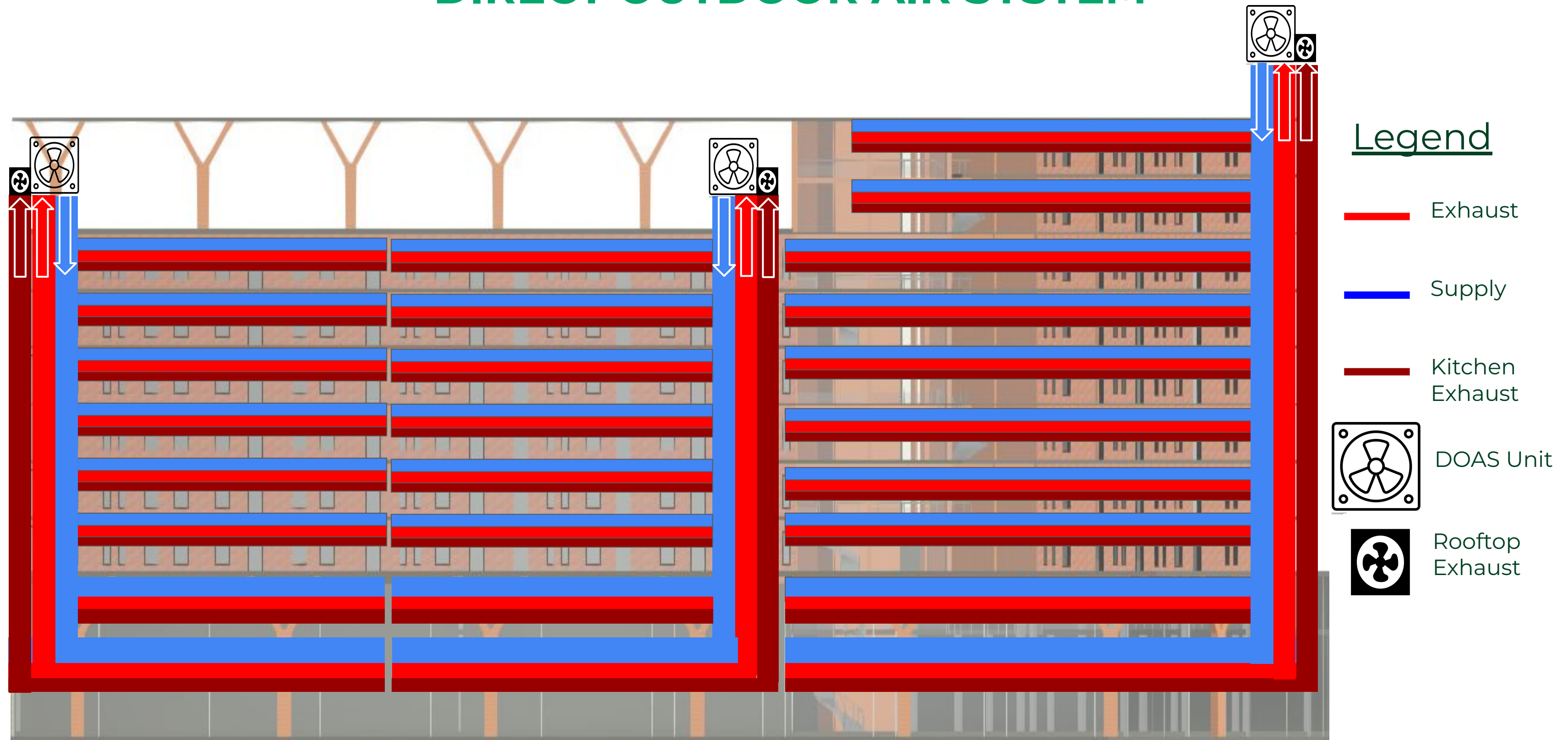
GEOHERMAL VRF



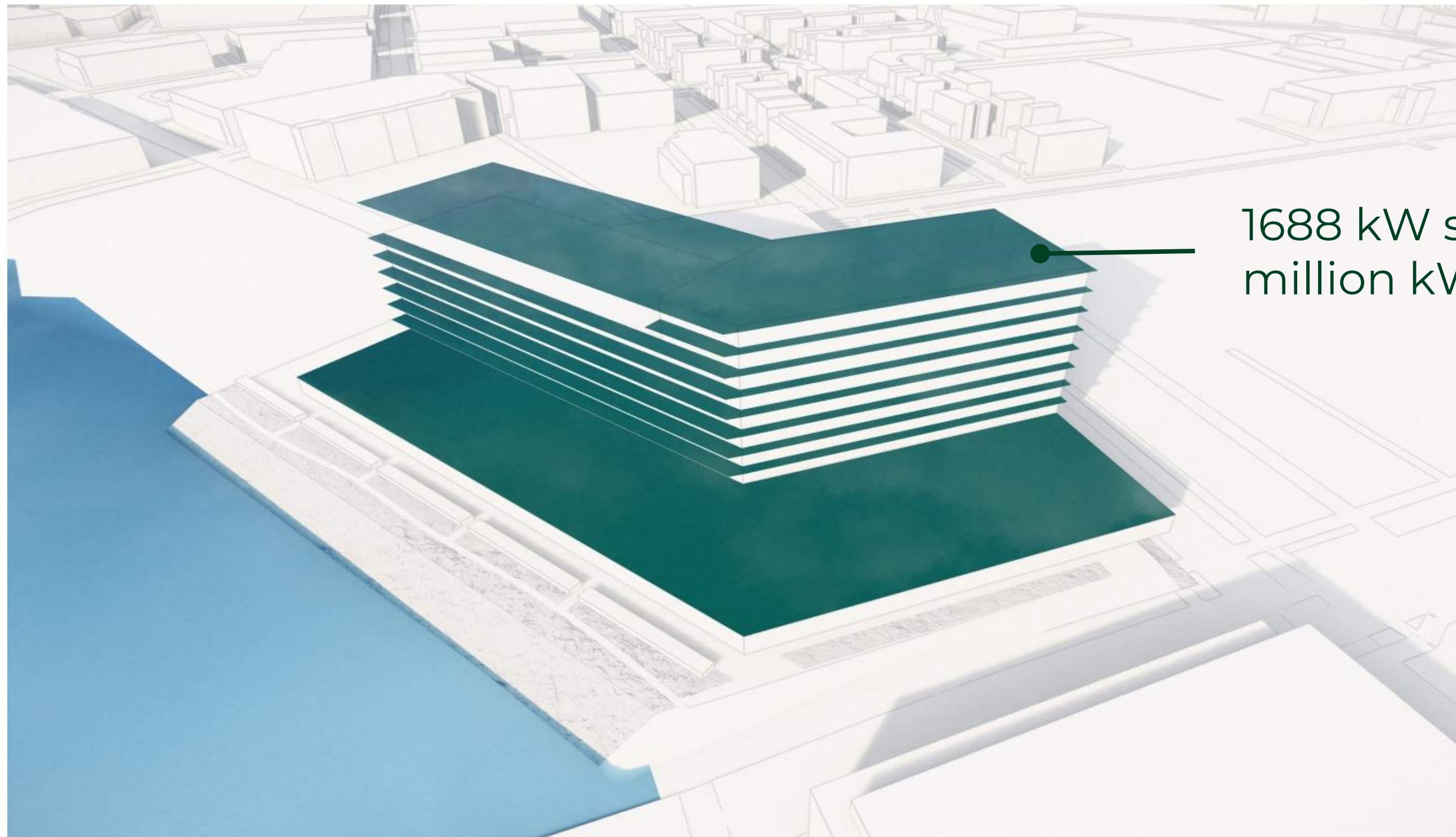
Legend

- Manifold
- Pump
- Heat Pump
- BC Controller
- Indoor Unit
- DOAS Unit
- Fan Coil Unit
- R455A
- Warm Water
- Cold Water

ACTIVE SYSTEMS DIRECT OUTDOOR AIR SYSTEM



ACTIVE SYSTEMS PV SYSTEMS



1688 kW system: 2
million kWh/yr

LED LIGHTING



LED LIGHTING



APPLIANCES



LED LIGHTING



APPLIANCES



AUTOMATION & PLUG LOADS



Legrand
Occupancy sensor



LUTRON
Daylighting sensor

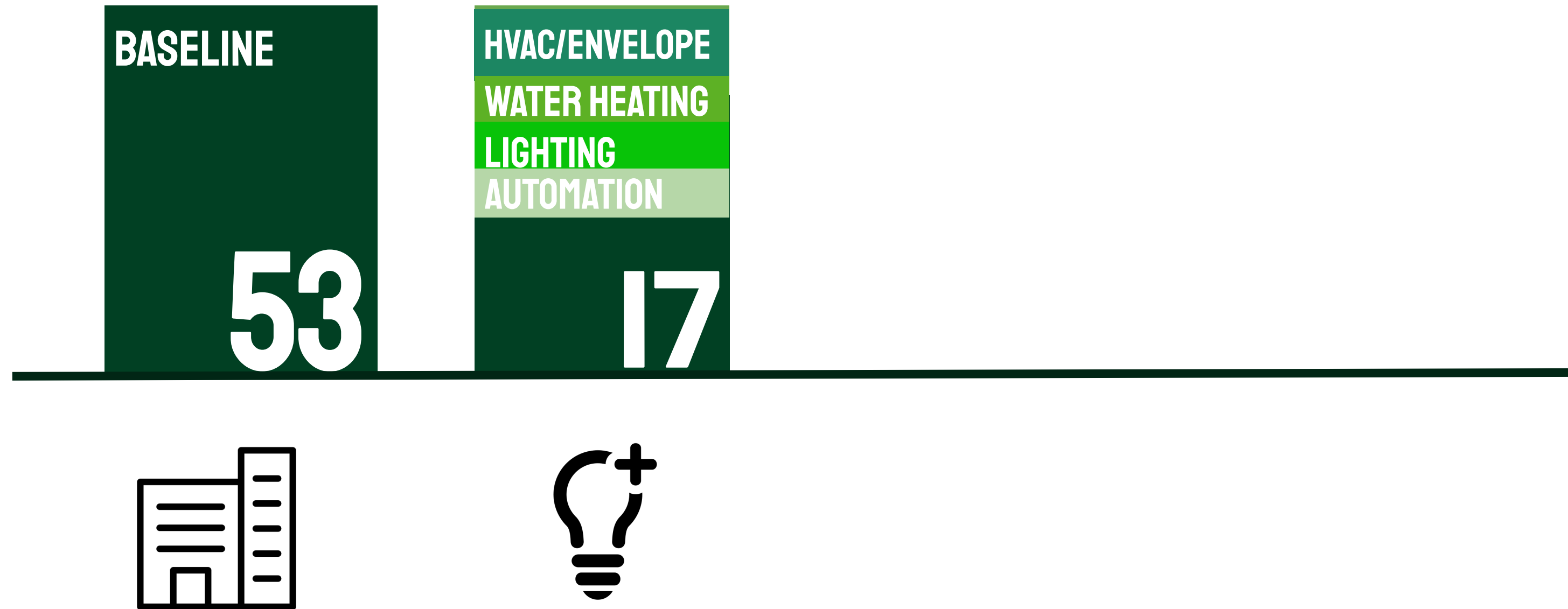


Legrand
Plug-load manager

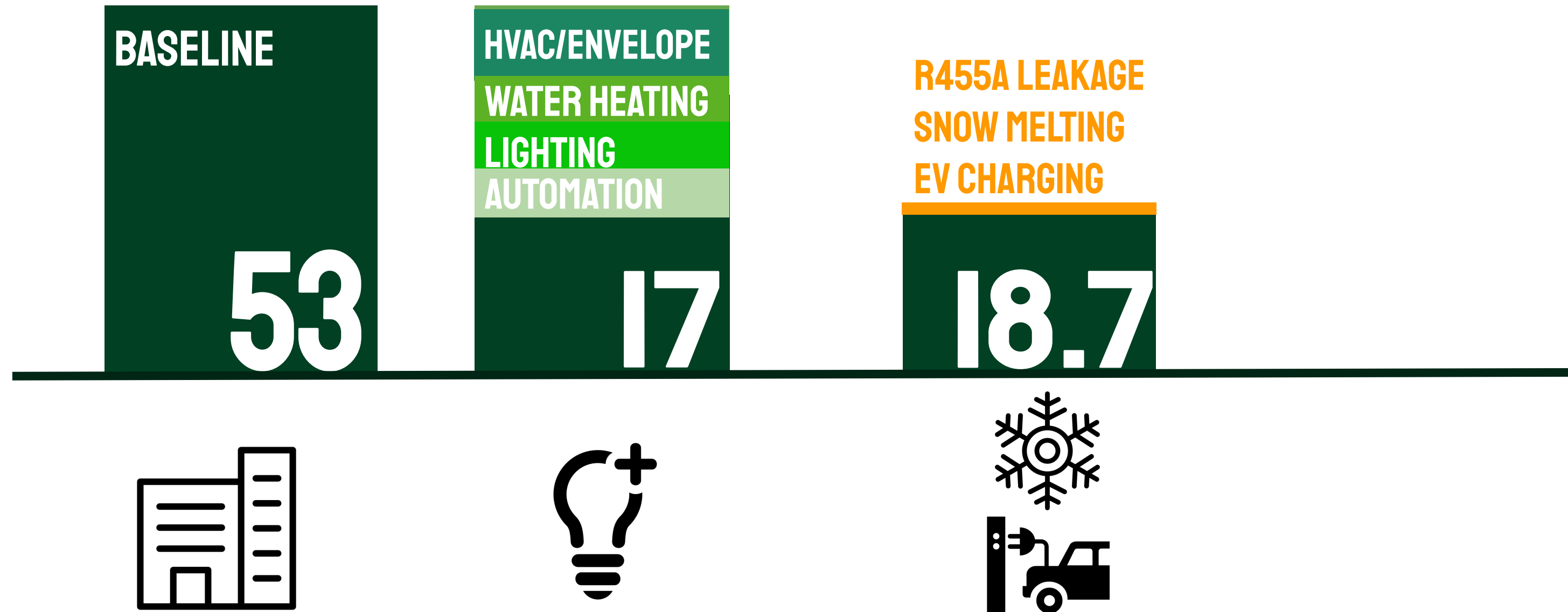
EUI (KBTU/SQFT-YR)



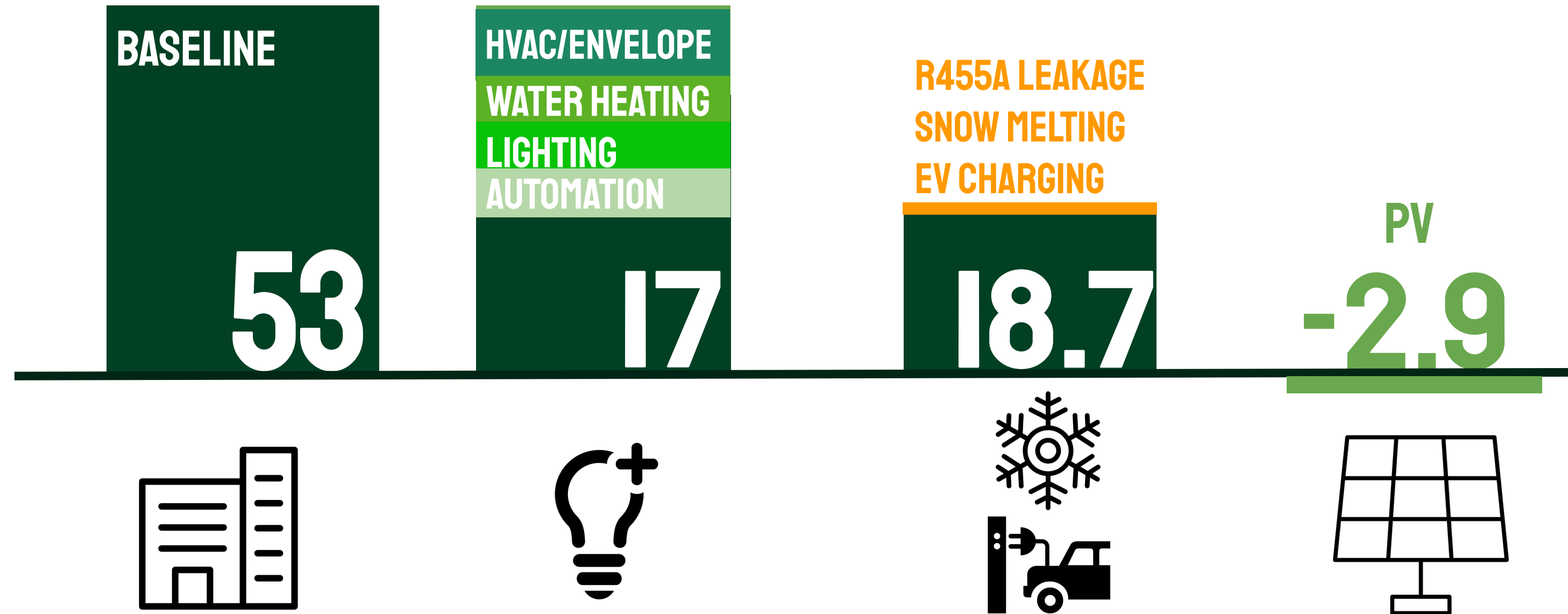
EUI (KBTU/SQFT-YR)



EUI (KBTU/SQFT-YR)

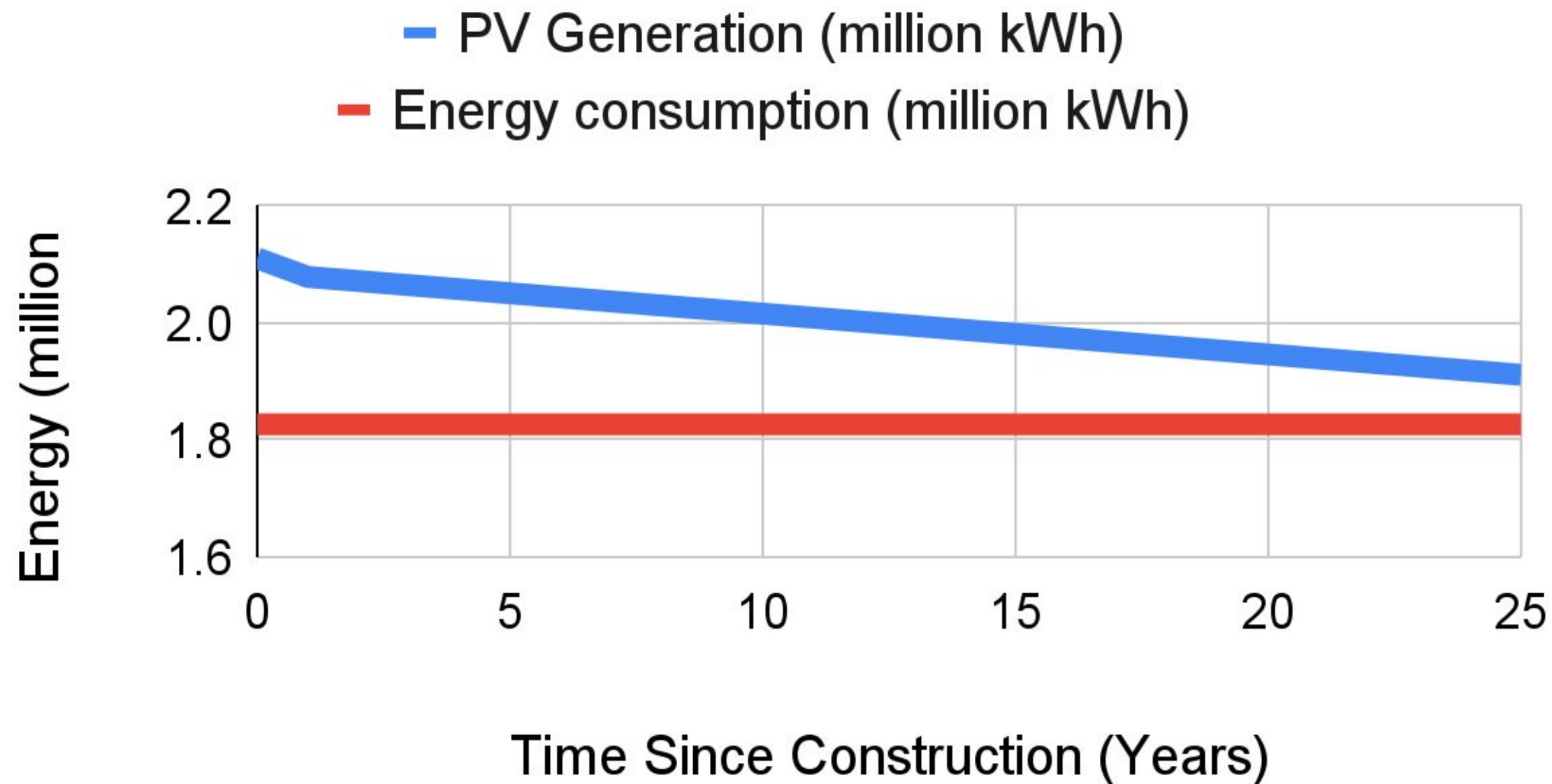


EUI (KBTU/SQFT-YR)



LONG-TERM ENERGY PERFORMANCE

PV Generation vs. Energy Consumption



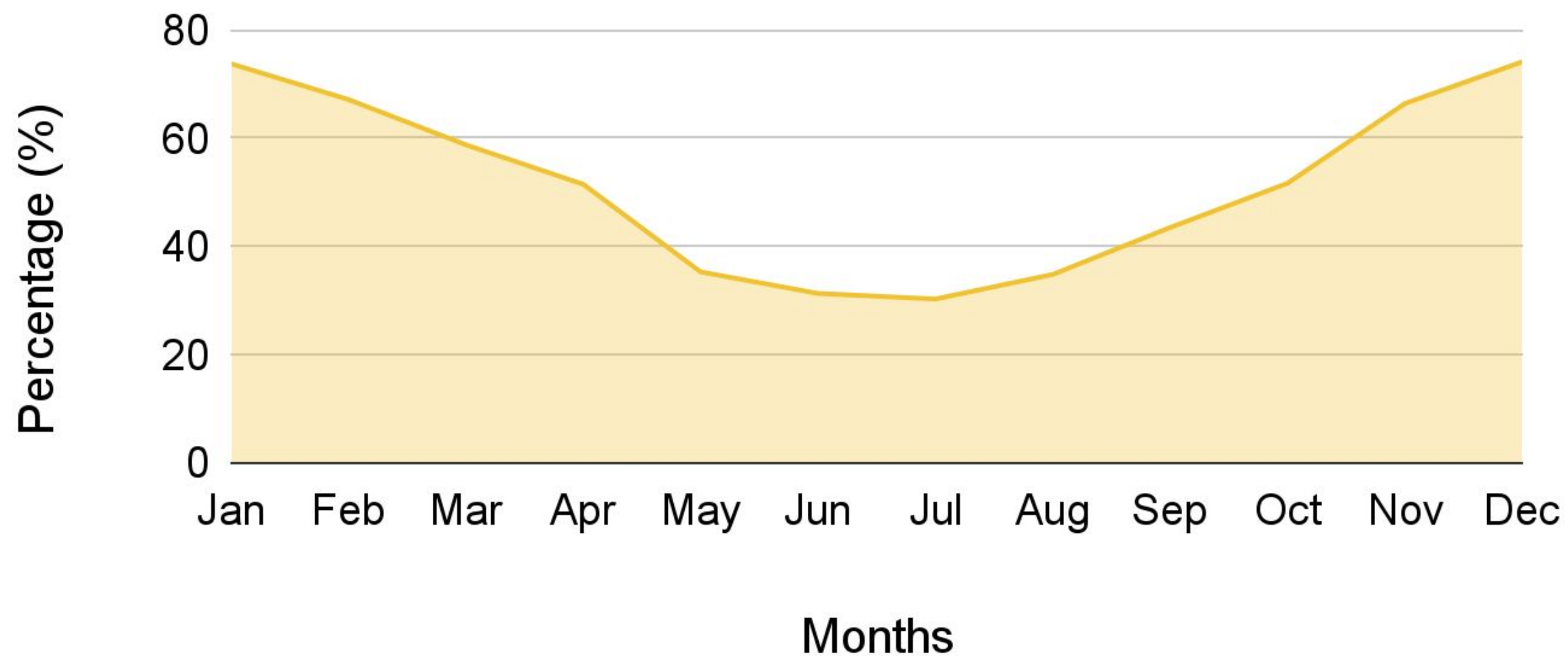
25 YRS
net-positive guaranteed

GRID RESILIENCE

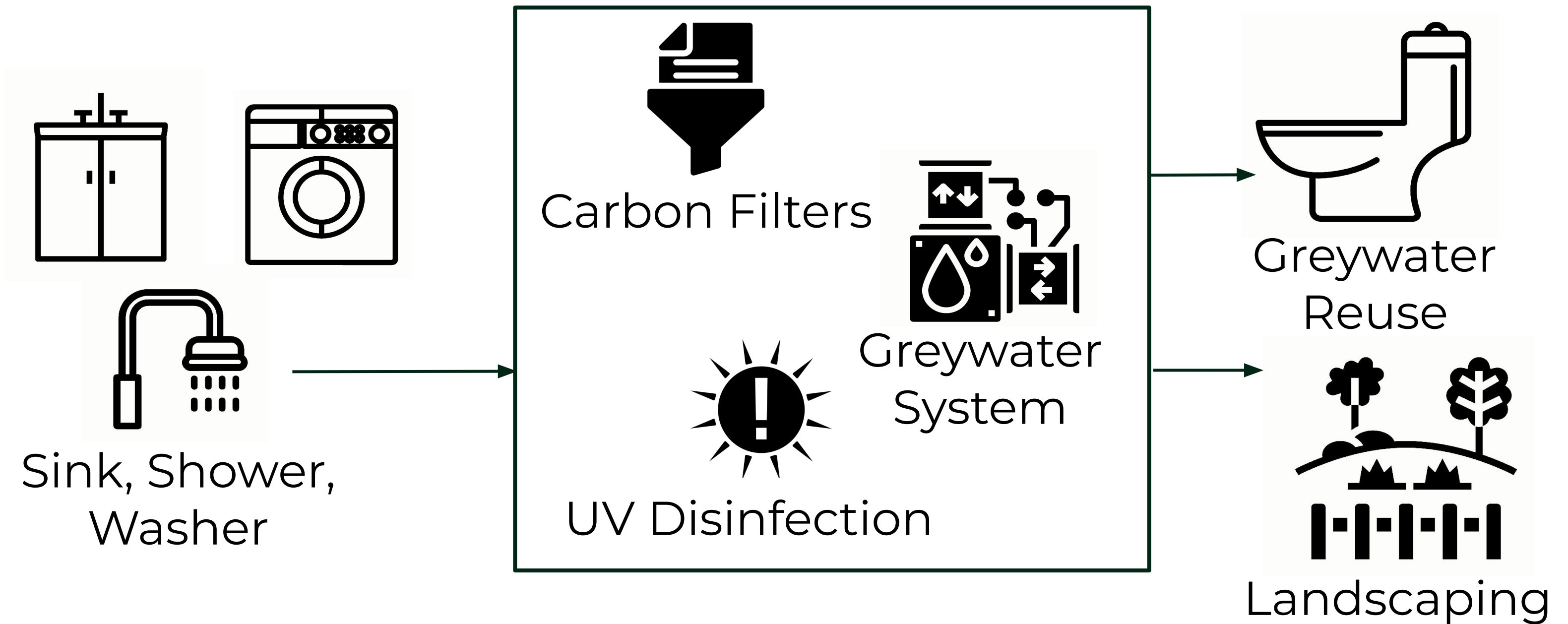
UP TO 70%

Reduced peak time loads

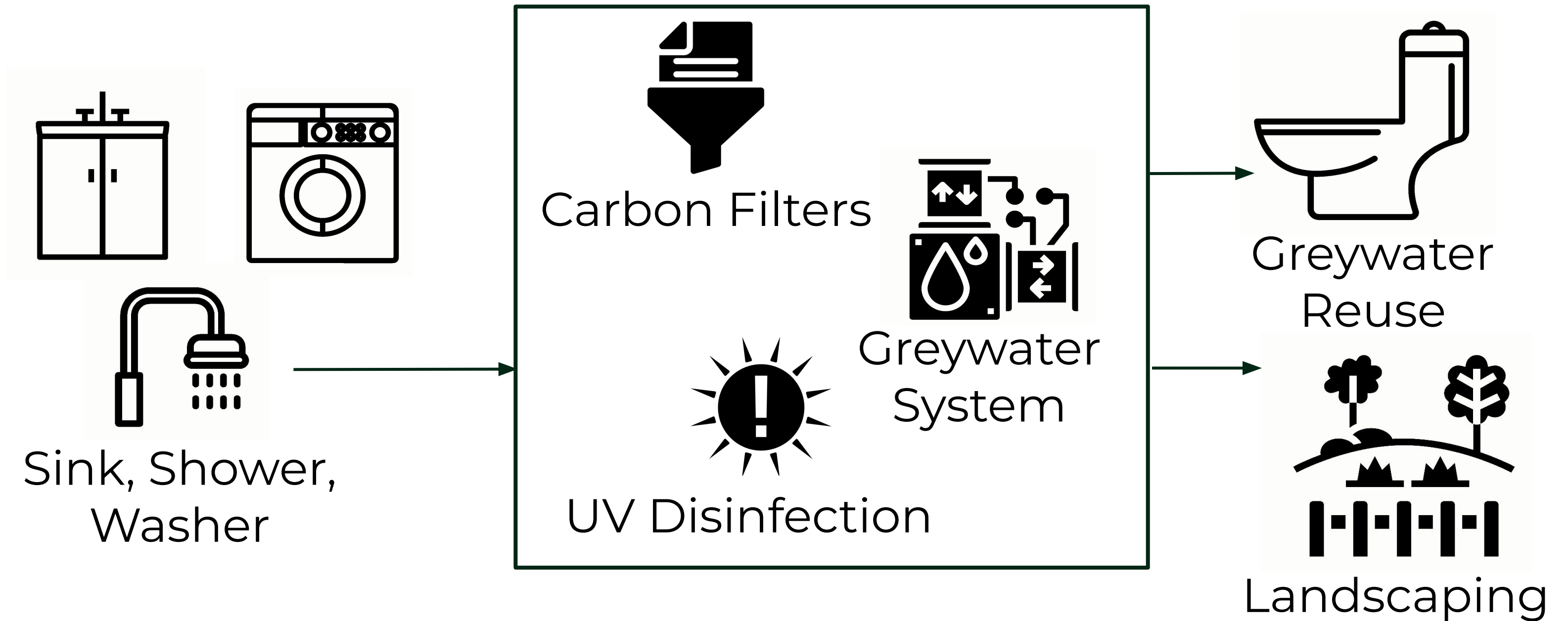
Monthly Peak Time Grid Utilization



WATER DISTRIBUTION

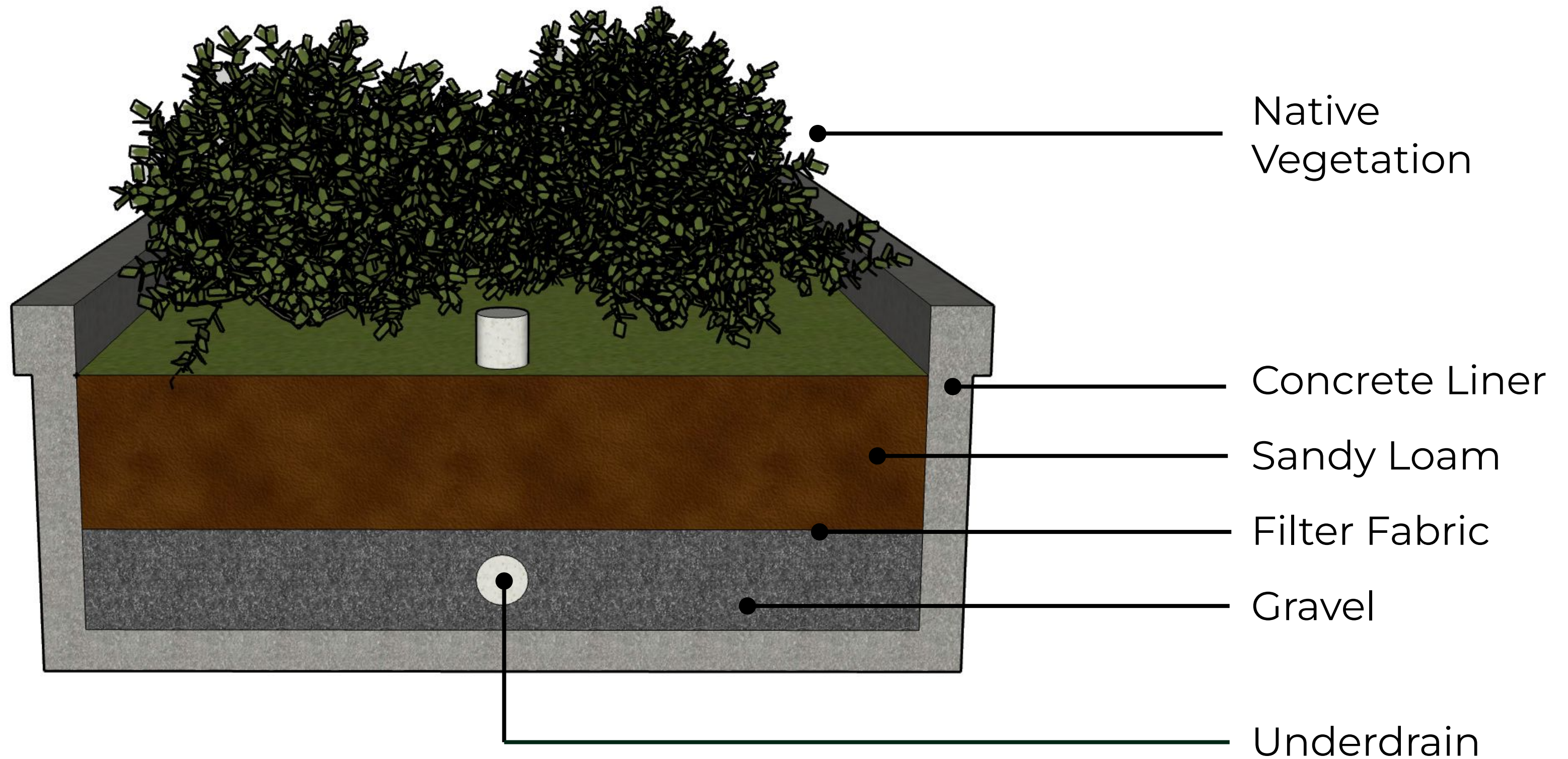


WATER DISTRIBUTION



40% WATER SAVINGS

STORMWATER MANAGEMENT



WILD MILE INTEGRATION





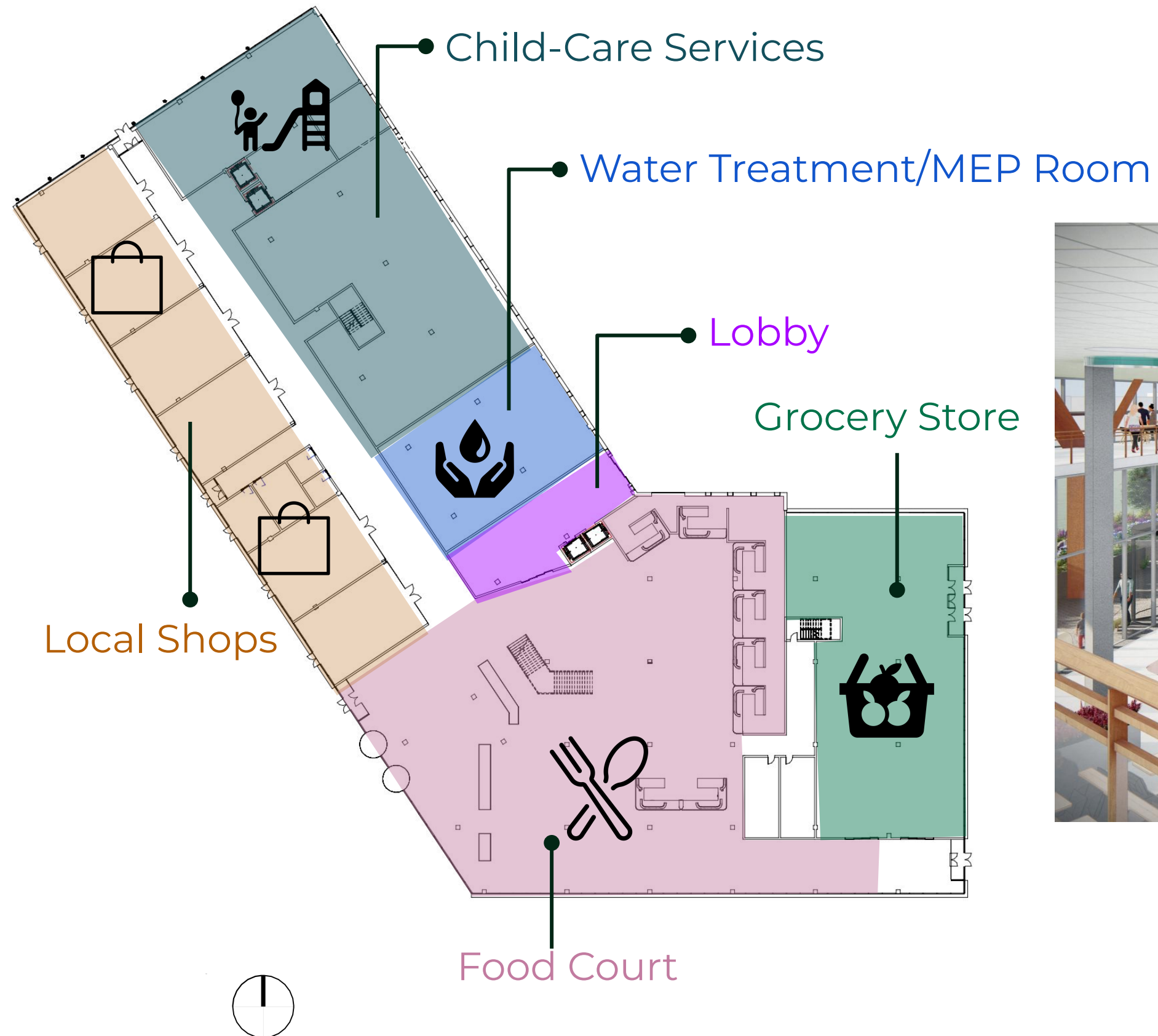
COMMUNITY

Design Approach

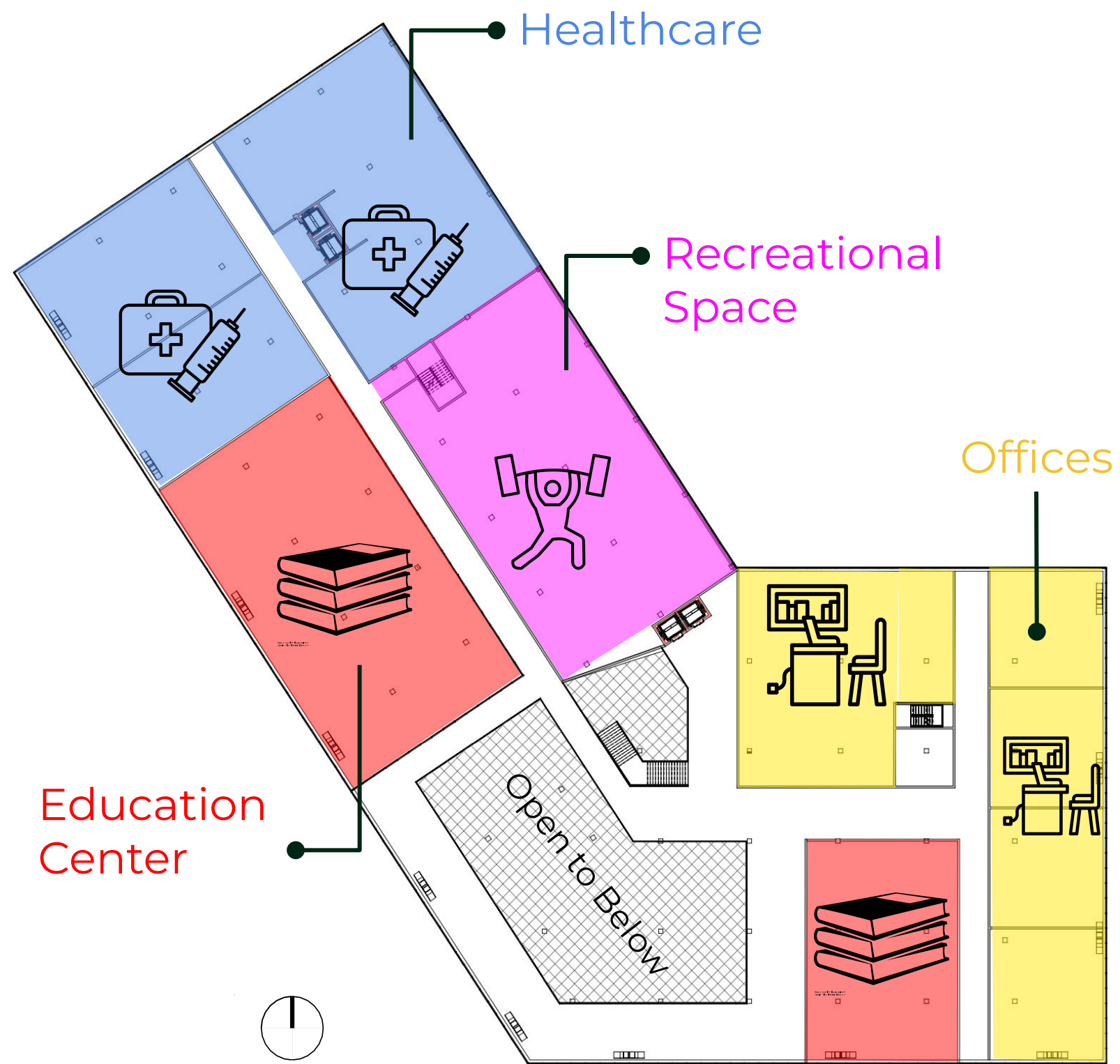




FIRST FLOOR



SECOND FLOOR



RESIDENTIAL FLOOR



RESIDENTIAL FLOOR



ENVIRONMENTAL QUALITY



Visual Comfort

- ✓ Daylighting Sensors
- ✓ Biophilic Design
- ✓ Operable Shading

ENVIRONMENTAL QUALITY



ENVIRONMENTAL QUALITY



Acoustic Comfort

- ✓ Mineral Wool
- ✓ Thin Concrete between floors
- ✓ Minimized Vibration



MARKET ANALYSIS

Design Approach

TREEHOUSE RENT PRICES

1 BED

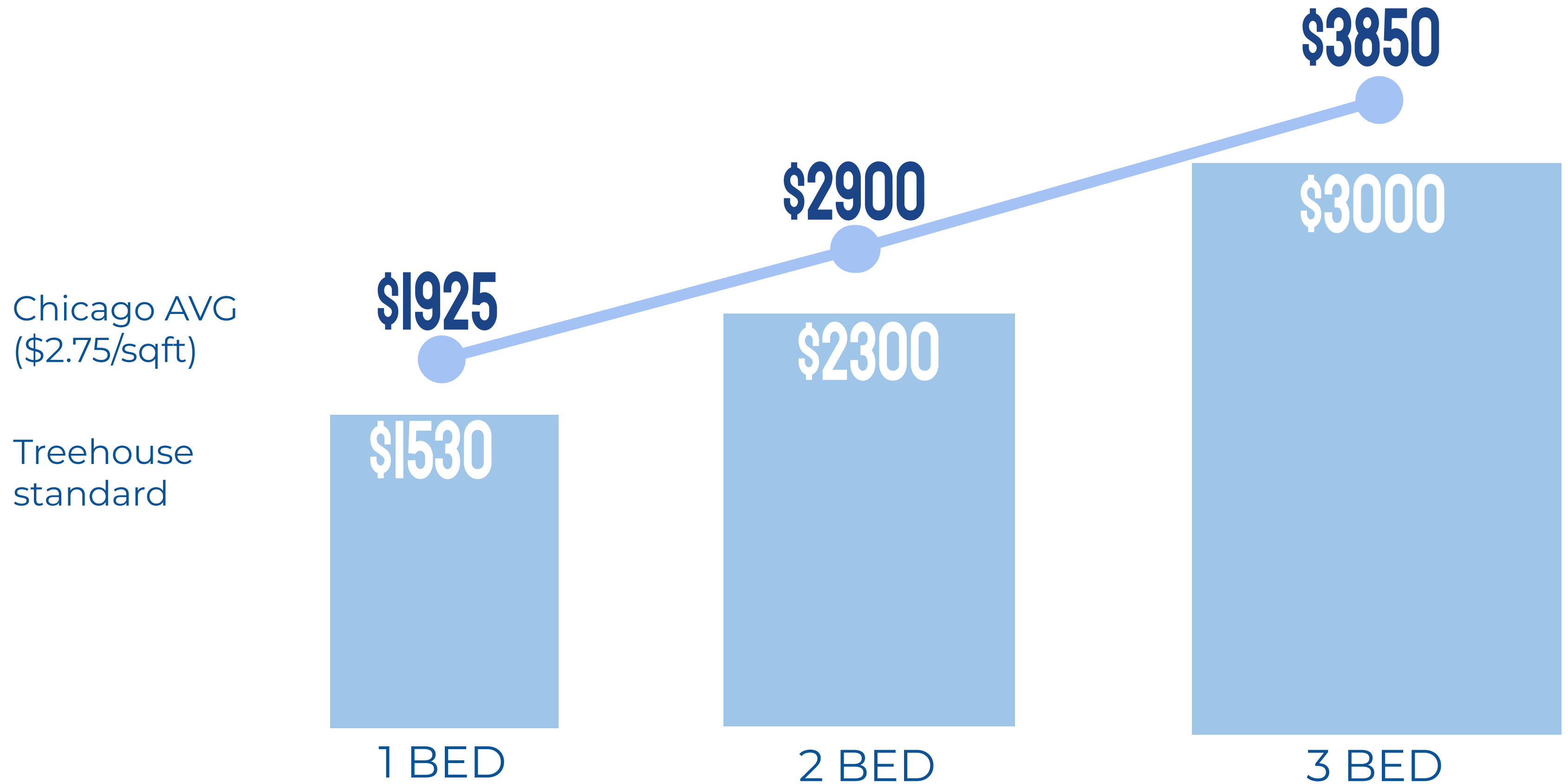
2 BED

3 BED

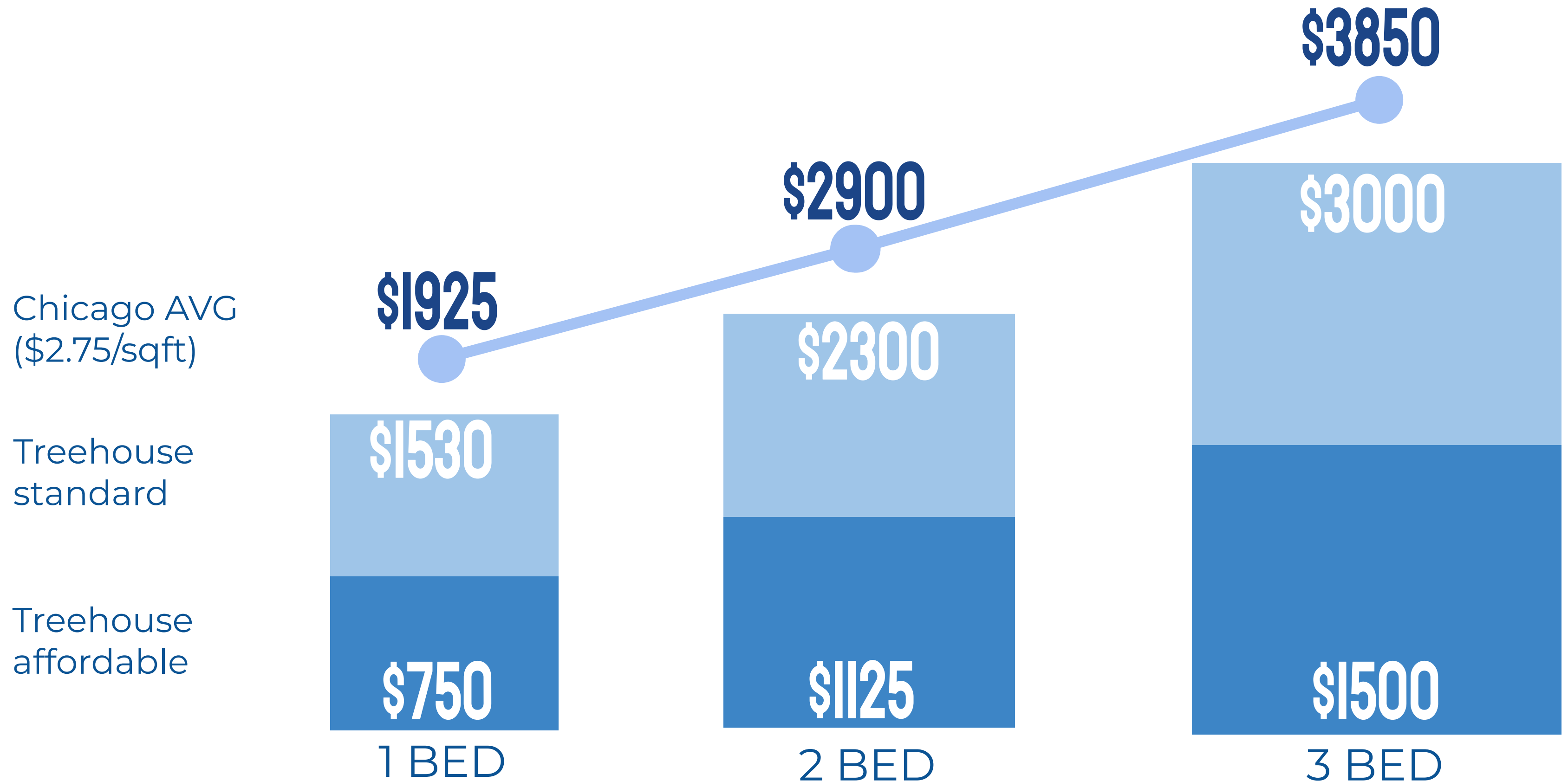
TREEHOUSE RENT PRICES



TREEHOUSE RENT PRICES



TREEHOUSE RENT PRICES



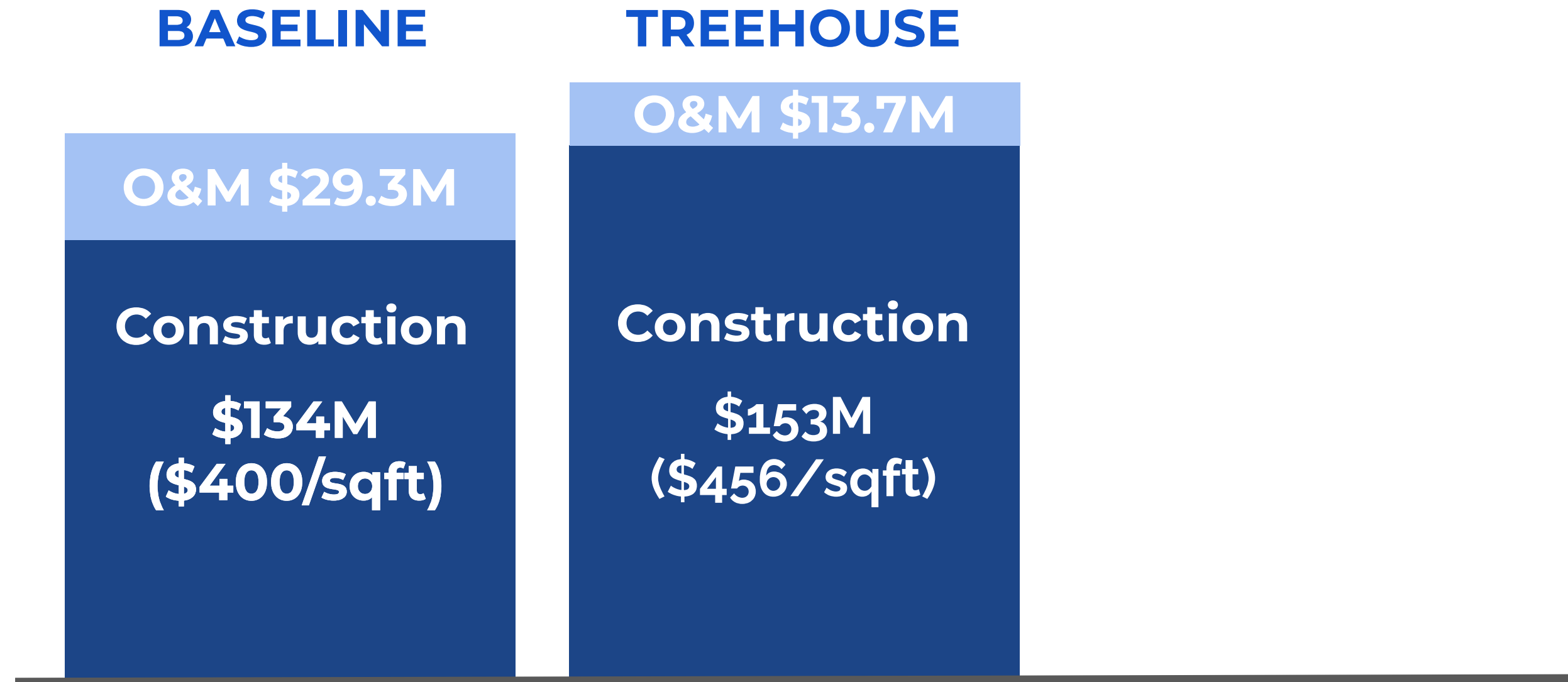
LIFECYCLE COST OVER 30 YEARS

BASELINE

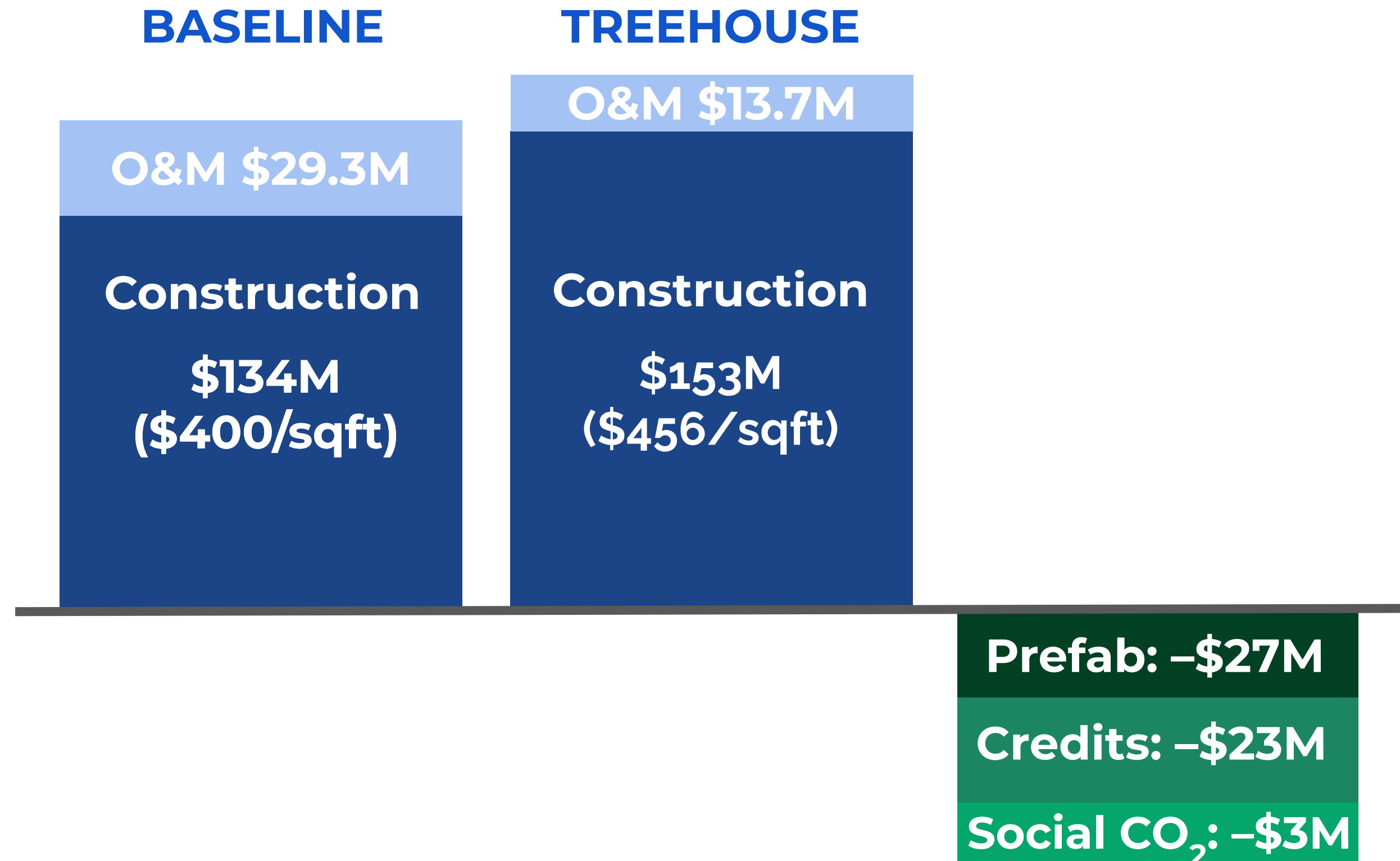
O&M \$29.3M

Construction
\$134M
(\$400/sqft)

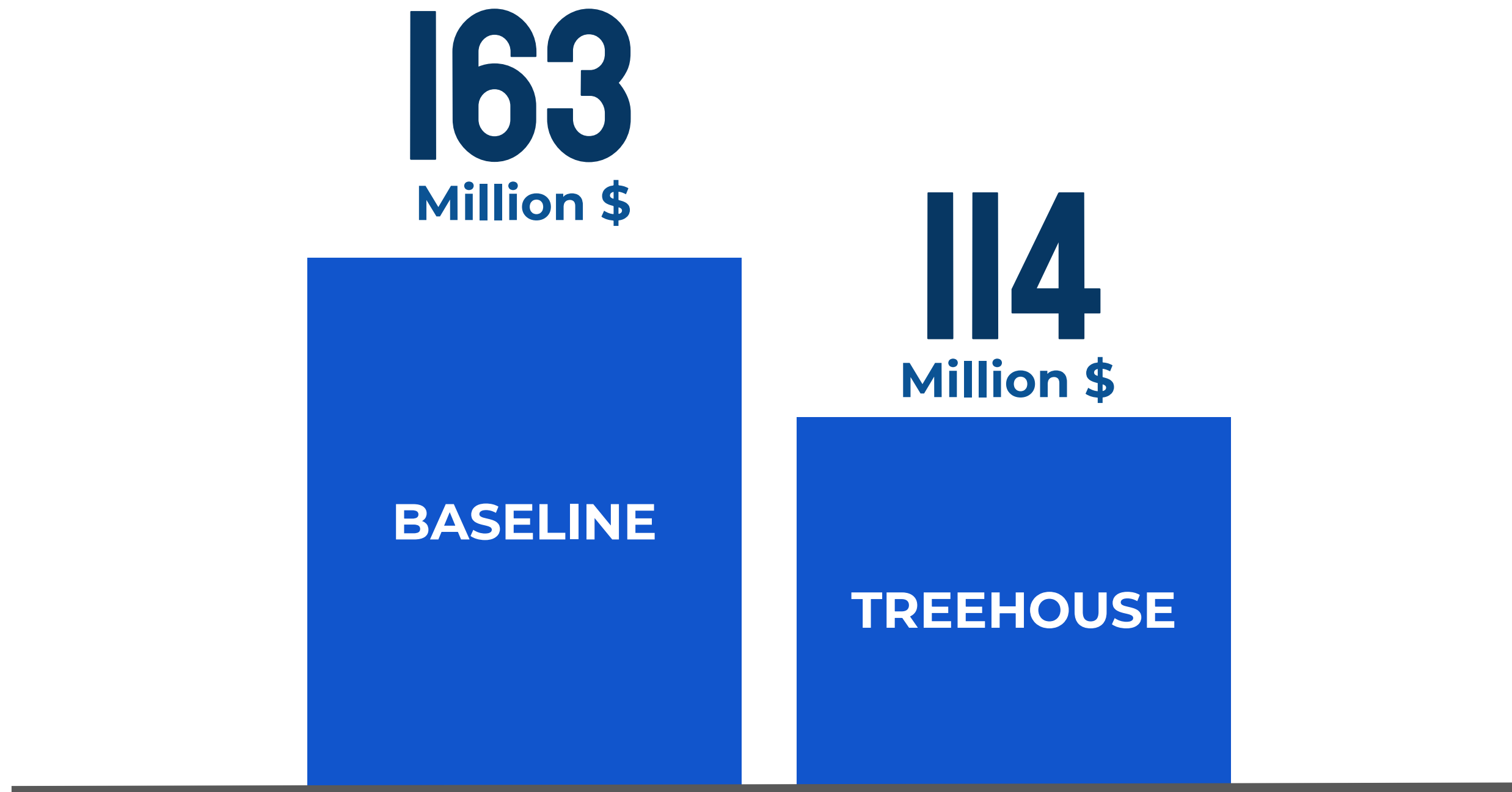
LIFECYCLE COST OVER 30 YEARS



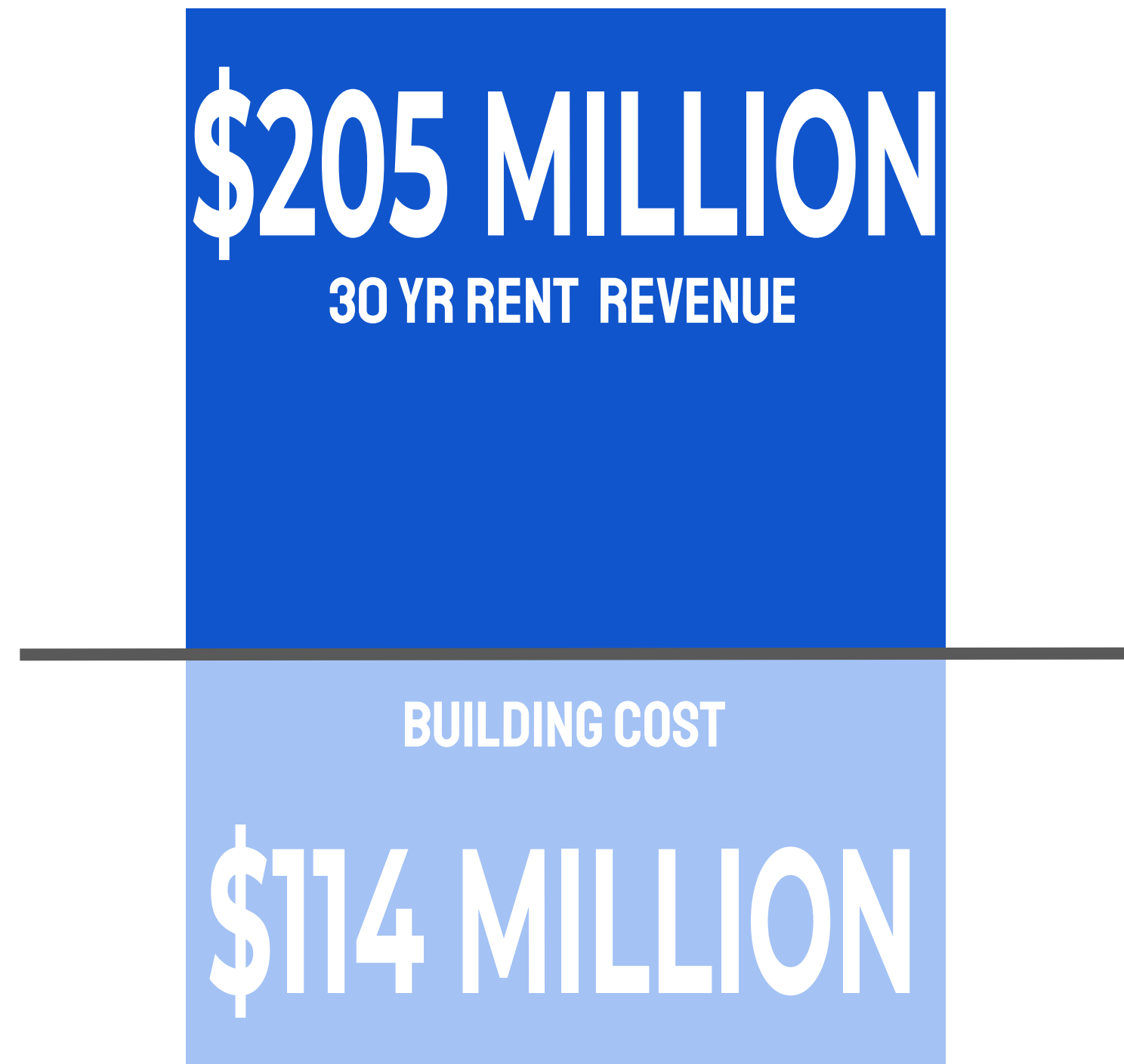
LIFECYCLE COST OVER 30 YEARS



LIFECYCLE COST OVER 30 YEARS



LIFECYCLE PROFIT



SUSTAINABLE

PASSIVE

NET-ZERO

LOW EMBODIED CO₂

PREFAB W/ LOW
WASTE

EV-READY

STORMWATER
RETENTION

COMMUNITY

AFFORDABLE

HEALTHCARE &
EDUCATION

LOCAL BUSINESSES

COMMUNITY SPACE

GREEN
INFRASTRUCTURE

INCREASED QUALITY
OF LIFE

“It’s time our cities turn over a new leaf, with TreeHouse”

SUSTAINABLE

PASSIVE

NET-ZERO

LOW EMBODIED CO₂

**PREFAB W/ LOW
WASTE**

EV-READY

**STORMWATER
RETENTION**

COMMUNITY

AFFORDABLE

**HEALTHCARE &
EDUCATION**

LOCAL BUSINESSES

COMMUNITY SPACE

**GREEN
INFRASTRUCTURE**

**INCREASED QUALITY
OF LIFE**

TH TREEHOUSE

“It’s time our cities turn over a new leaf, with TreeHouse”

SUSTAINABLE

PASSIVE

NET-ZERO

LOW EMBODIED CO₂

**PREFAB W/ LOW
WASTE**

EV-READY

**STORMWATER
RETENTION**

COMMUNITY

AFFORDABLE

**HEALTHCARE &
EDUCATION**

LOCAL BUSINESSES

COMMUNITY SPACE

**GREEN
INFRASTRUCTURE**

**INCREASED QUALITY
OF LIFE**

TH TREEHOUSE



“It’s time our cities turn over a new leaf, with TreeHouse”